TOOLING & PRODUCTION Magazine

NOVEMBER 1959

Talk of the Month: Motivation In A Competitive World 11
by George E. Holbrook

Die Metal Solves Tough Drawing Job 48

Drillhead Has 10 Tilted Spindles 50

More "Building Blocks" 58

Mobile Power Unit Speeds Milling 62

Barrel Finishing Cuts Cost of Clock Parts 68

Throw-Aways Cut Costs 60% 68

Departments in This Issue:
Personally Speaking 4

Manufacturing Memos . . . 14

Deaths 18

New Calling Cards 25

Men You Should Know . . . 28

Book Reviews 70

Catalogs — and other helpful literature 72

Product News 88

Cumulative Editorial Index . . 124

Machine Tools Via N-C . . . or . . . The Builders Should Practice What They Preach 33
Editorial by E. Willard Pennington

Common Sense and Machine Tools 35
A Guest Editorial by Clarke Redfield

Europe 'Roughs Up' Ceramics 37
by Jean-Louis Guedeu

Peg Board Controls Milling Cycles 40

Checking Machine Ways . . . After Scraping 41
by R. Bellmann

Heat Treating Today: Quenching Last of a Series 45
by Lester F. Spencer and Charles Weiner

Use Your Press Tonnage Wisely 49
by Robert E. Sanford

Restrictions on Patent Licenses 51
by Albert Woodruff Gray

Who Gets That Promotion? A Guide for 'promoters' and 'promotees' . . 60
by Ernest W. Fair

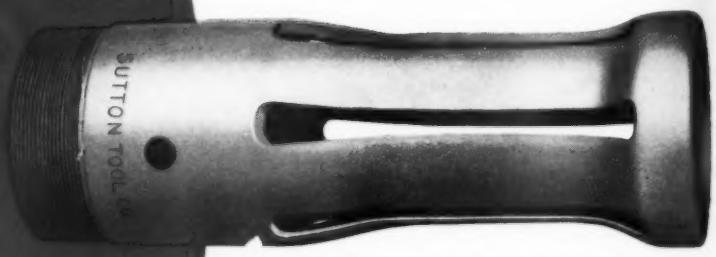
Duplicate Prints Improve Account Control 65
by Joseph C. Marek and Victor J. Marek

ommon Sense and Machine Tools . . . page 35

3 best friends of an automatic bar machine

Style "L" Master Feeder—Interchangeable and replaceable pads seated in recess, with lug engaging a slot in the master to keep pads from rotating. No pins or screws. Style "L" handles stock practically up to machine capacity.

Super Cage-type Feeder — Advantageous for short runs. Tension easily adjusted simply by tapping with hammer, since multiple grips act as springs. Handles round, hexagon or square stock. Available in non-marring bronze.



Conventional Solid Feeder — Manufactured according to the dimensional specifications of Machine Tool Builders. Made from specially selected steels and given proper heat-treatment to provide better gripping and maximum tension for the life of the feeder.

These three feeders are the old reliables! 90% of all bar machine operations are performed with them! That's why it's important to use Sutton feeders. Sutton specializes in these three types—steel to exacting requirements, uniformity of tension, immediate deliveries from stock.

Sutton supplies a variety of feeders for specialized types of work; odd shapes for special extruded stock, combination feeders and feeder tubes for over-size stock. Call on Sutton for designing, engineering and manufacturing!

RUNS AS TRUE AS THE SPINDLE

Write For Free 28 Page Catalog

Sutton Tool Company

Dept. TP-11, Sturgis, Michigan

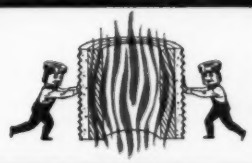
CIRCLE INFORM-A-GRAM KEY NO. 2

CERAM-A-GRIP® *America's New ceramic* Precision Drill Bushing for PLASTIC TOOLING

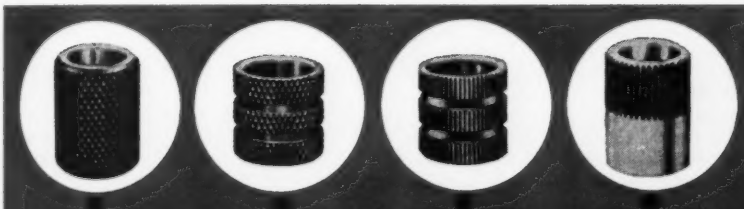
NOTE THE RUST-RESISTANT FINISH

CERAMICS — used as a barrier against the tremendously high temperatures encountered by the nose cones on ballistic rockets, has been adapted by the American Drill Bushing Co. to a line of precision drill bushings for use in plastic tooling. The Ceram-A-Grip bushing gives a maximum of protection against bushing misalignment and spin out, with a minimum sacrifice of close hole spacing.

EXCITING new development from the Space Age Laboratories



DO YOU HAVE A FRICTIONAL HEAT PROBLEM? THE THIN CERAMIC SHELL PROVIDES AN EFFECTIVE HEAT BARRIER! CERAMIC MATERIAL FUSED TO THE OUTER SURFACE OF THE PRECISION DRILL BUSHING EFFECTIVELY INSULATES THE PLASTIC POTTING MATERIAL FROM ANY EXCESS FRICTIONAL HEAT BUILD-UP IN THE BUSHING.



DELT-A-GRIP Pat. No. 2,699,547 DELT-A-GROOVE SERR-A-GROOVE SERR-A-GRIP

HEX-A-GRIP Pat. No. 2,729,249 HEX-A-GROOVE THERR-A-GRIP Pat. Pend. American REDGRIP Pat. Pend.

LOOK TO American FOR A COMPLETE LINE OF DRILL JIG BUSHINGS FOR PLASTIC TOOLING

SEND FOR CATALOGS AND COMPLETE INFORMATION

American DRILL BUSHING CO.

3107 Pacific Blvd. • Los Angeles 58, Calif.

Also ask for information on our new THINWALL line of regular drill bushings.

CIRCLE INFORM-A-GRAM KEY NO. 3

highest finish!

get a perfect finish with PRESSURELOK®

Starting with the best Diamond wheel is not enough . . . it's the finish that counts. It costs you nothing to make more profit in your grinding operation.
PRESSURELOK builds optimum performance into every United States Diamond Wheel —yet your carbide grinding costs may be reduced by using a different type, size, grit or hardness of wheel from which you are now using.
United States Diamond Wheel Co. is pioneering on-the-job "Progressive Specification" to warrantee you the top carbide grinding efficiency.

HERE'S WHY PRESSURELOK WORKS BEST
Pressurelok (the Performance Bond) makes the best of all Diamond wheels because it scientifically combines warranteed amounts of graded Diamonds distributed in constant density throughout a perfect bond which wears uniformally at the ideal rate of Diamond usage.

be SURE. . .get PRESSURELOK®

THE PERFORMANCE BOND
This wheel is a precise duplication of your specification, warranteed when properly operated, to give you the lowest cost per cut of any wheel.

Write for our catalog No. 957 or call us at Aurora (Illinois) 7-9181 for "Progressive Specifications" on your job without any obligation on your part.

US UNITED STATES DIAMOND WHEEL CO.

935 ILLINOIS AVENUE AURORA, ILLINOIS
CIRCLE INFORM-A-GRAM KEY NO. 4

TOOLING & PRODUCTION Magazine

NOVEMBER 1959
VOL. XXV No. 8
GEORGE J. HUEBNER, Founder
1885 - 1956

PERSONALLY SPEAKING

Dear T & P Reader:

At press time for this column, the steel strike is still going on. The ore fleet is idle. In Cleveland the big ore carriers lie at anchor, lashed together in the harbor in groups of three and four and five ships.

There has been much conversation about this current strike in many quarters—by government, labor, business and groups of citizens who have nothing directly at stake. It is a matter of general concern and it is hard to escape discussion of it if one has any interest whatever in what's going on.

It seems to us that one thing is becoming more and more apparent, the right to strike is a dubious right, indeed. And yet, our brand of freedom must grant the right to strike. Otherwise we wouldn't have the freedom that we brag about. Calling a strike imposes enormous responsibility on the leaders because they are not infallible and therefore their judgment is not necessarily without error. The point where this strike began to create severe hardship has long since been passed.

The idea appeals to us that the smartest labor leader would be the one who gains for his constituents by negotiating a solution without strikes. I'm sure the economic status of his union's members would be much better by this means.

There is another angle that should be considered today in labor management. It is the imperialistic, or paternalistic, attitude that seems to prevail much too often. In the early days of the formation of this nation, there were two widely divergent philosophies of government. One was that largely advocated by Alexander Hamilton and his supporters, whose general attitude was that the intelligentsia should run the government because the rank and file of citizens were too ignorant, inexperienced and immature to make decisions affecting the welfare of the nation. On the other side, we had men in government who attributed to the people at large full capability to direct the affairs of their nation.

It seems to us that the Hamiltonian attitude is entirely too prevalent in the labor movement today and that too little opportunity is accorded rank and file union members to express themselves on various points which vitally concern them. For example, in the last few days the steel companies apparently have made an offer. Labor management has walked out on the offer. Would the members do likewise, if they had a chance to express themselves?

Something has to give somewhere, sometime soon, and, of course, the strike has gone so long now that it would be utterly impossible for labor to gain concessions great enough to make up for anything but a very small percentage of the loss that has been incurred by union people.

Cordially yours,

Ray Huebner

Publisher

Business Staff
R. L. Huebner, Publisher
P. E. Hager, Production Manager — B. C. Jackson, Research Manager
E. J. Brooks, Art Director — Mary Yoshida, Contract Manager
Roger C. Mills, Circulation Manager

Editorial Staff:
E. Willard Pennington, Editor
Carol E. Reuss, Managing Editor
William E. Hoffman, Associate Editor — Carl F. Benner, Contributing Editor
Charles Weiner, Assistant Editor — Ernest J. Urbas, Contributing Editor
Jeannette T. Wyckoff, Assistant Editor — Nyles V. Reinfeld, Contributing Editor

Editorial and Business Offices: 1975 Lee Road, Cleveland 18, Ohio, FAirmount 1-4040
Printing Office Address: P.O. Box 1494, Louisville, Ky. (For Plate Shipments Only)

Published Monthly by HUEBNER PUBLICATIONS, INC.

R. R. HUEBNER.....Chairman, Secretary, Treasurer
RAY L. HUEBNER.....President — GEORGE J. HUEBNER, JR.....Vice President

Copyright by Huebner Publications, Inc., 1959. Accepted as Controlled Circulation Publication at Shepherdsville, Ky. Single copies $1.00 each. U. S. subscription rate $2.00 per year for metalworking plant operating executives and department heads. All other subscriptions $6.50 per year. All foreign subscriptions, $10.00 per year.

V-R Ceramic VR-97

Ceramic VR-97 Turning SAE 5060 Steel Tubing at 1320 SFPM, Ford Motor Co. Automatic Transmission Plant

Proven in production at Ford Motor Company

Ceramic VR-97 is a proven performer in many machining operations at the Ford Motor Company's Automatic Transmission Plant, Livonia, Michigan. Here, and in hundreds of other progressive plants across the nation, VR-97 has been proving its value on continuous production runs. People who considered ceramic tooling as merely "experimental" a short time ago now rely on ceramic VR-97 as an important part of their production picture.

Whether you are interested in increased machine output, higher speeds, better finish or machining hardened steel and cast iron, it will pay you to know more about ceramic VR-97. Contact your nearest V-R representative or write for complete information.

Ask for Product Information BULLETIN NO. 59.1 covering Ceramic VR-97.

V-R Vascoloy-Ramet corporation

PRIME MANUFACTURERS OF REFRACTORY METALS ENGINEERED FOR THE JOB

C-729

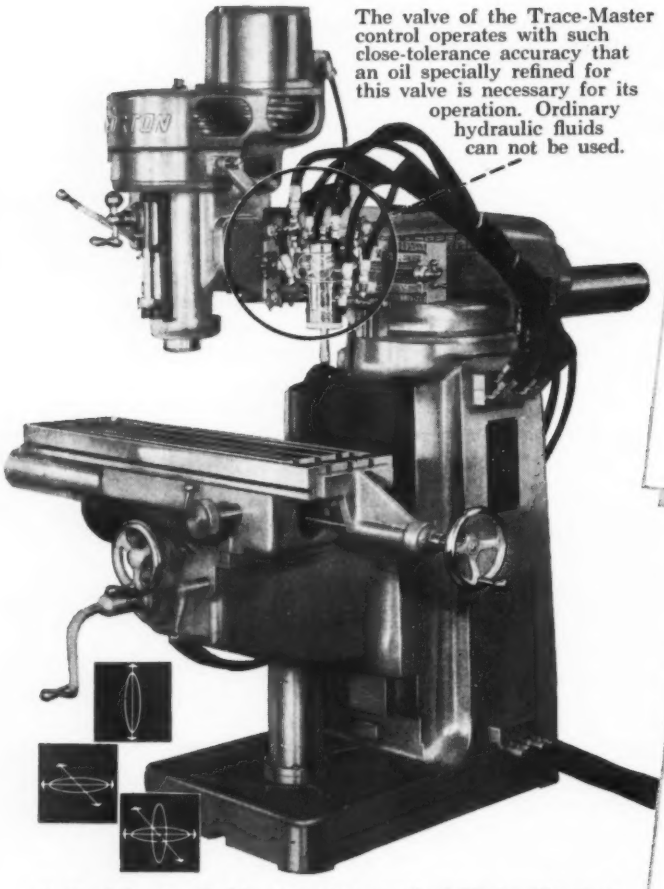
828 Market Street • Waukegan, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 5

Designed for the "*Missile Age*"

GORTON "Trace-Master" Mastermil

with exclusive combination of sustained toolroom accuracy and precision-built Trace-Master Hydraulic tracer control



The valve of the Trace-Master control operates with such close-tolerance accuracy that an oil specially refined for this valve is necessary for its operation. Ordinary hydraulic fluids can not be used.

Nowhere Else will you find this combination

1. TWO H.P. spindle motor
2. Finest Milling Head in its class
3. 80 to 5,600 RPM spindle speeds
4. Rigidity . . . (2,800 lbs net weight)
5. Extra long saddle

Nowhere Else will you find this versatility

1. Production profiling
2. Scanning
3. Duplicating . . . die and mold work
4. Milling . . . conventional and climb
5. Boring

3 Models Available (1) 180° Vertical Hydraulic Feed to Knee (2) 360° Cross Hydraulic Feed to Ram and Longitudinal Hydraulic Feed to Table (3) 3D Hydraulic feed to knee, ram and table for 3-dimensional work.

Trace-Master controls can be furnished with the Model 1-22 Mastermil illustrated above or the Model 9-J Super-Speed Vertical Mill with single spindle, twin spindles and/or six inch higher column for additional vertical capacity.

Write for Bulletin 2771-1205

GORTON

GEORGE GORTON MACHINE CO.

1205 Racine Street, Racine, Wisconsin

SINCE 1893

Tracer-Controlled Pantographs, Duplicators — standard and special . . . Horizontal and Vertical Mills, Swiss-Type Screw Machines, Tool Grinders, Small Tools and Accessories.

AB-1007

CIRCLE INFORM-A-GRAM KEY NO. 6

UNIVERSAL DRILL BUSHINGS
industry's standard of quality and service

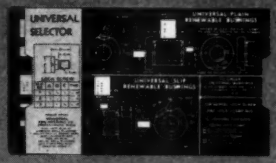
All standard sizes and lengths available for immediate delivery.

100% concentricity and hardness tests insure accuracy.

Knurled heads provide good grip.

Write for free catalog describing Standard Drill Bushings, Standard Collet Chucks, Floating Collet Chucks, Boring Chucks, Kwik-Switch Tool Holders, Mikro-Lok Boring Bars, Index Plungers and other Universal Products.

Superfinishing of Universal Drill Bushings is an important factor in keeping tool and bushing wear to a minimum . . . especially in close tolerance work. Blended radius helps prevent tool hang-up.



The Universal Drill Bushing Slide Chart gives accurate engineering data for the selection of all types and sizes of drill jig bushings up to 1¾" drill size. Request your calculator—free—on your company letterhead.

208

UNIVERSAL ENGINEERING COMPANY | FRANKENMUTH 8, MICHIGAN

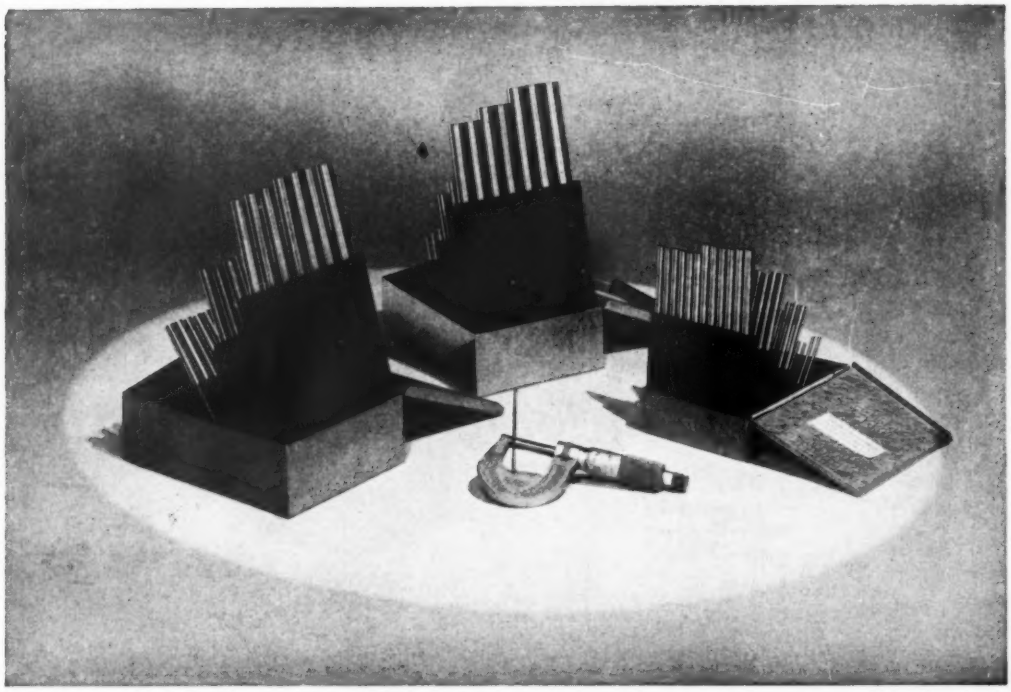
CIRCLE INFORM-A-GRAM KEY NO. 7

DRexel 6-4222 ESTABLISHED 1927

WILLIAM T. HUTCHINSON CO.

53 BROWN AVENUE SPRINGFIELD, NEW JERSEY

HUTCHINSON HSS BLANKS



115 Pieces – COMPLETE – .040" to .500" – $88.00

your choice of two tolerances
+ .0002" − .0000
or
+ .0000 − .0002"

JOBBER SET	LETTER SET	WIRE SET
$32.27	$29.03	$27.40
in Huot Index	in Huot Index	in Huot Index

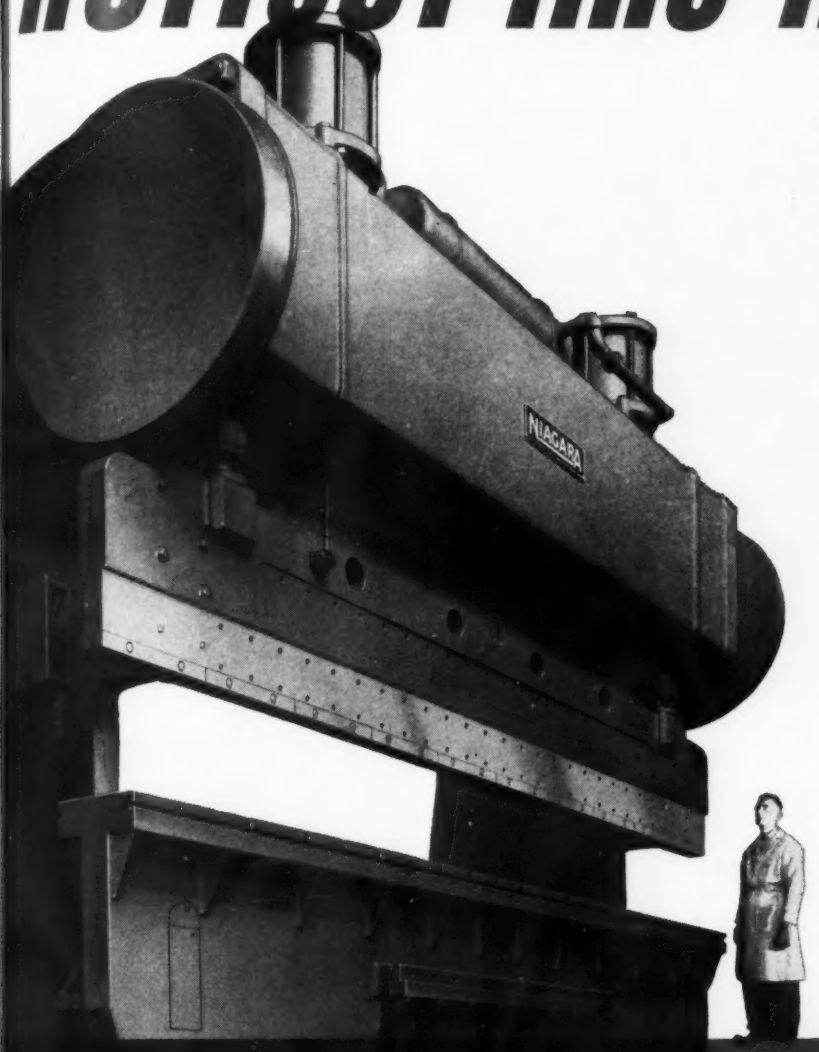
M2 — HIGH SPEED STEEL — 64 "C" scale hard — gage tolerance — mirror finish — parallel ground.

ANY DECIMAL DIAMETER OF STANDARD LENGTH
.012" TO 1.000" SHIPPED ON 24 HOUR NOTICE

CIRCLE INFORM-A-GRAM KEY NO. 8

NIAGARA PRESS BRAKES

hottest line in '59



..way out front in production-boosting, cost-cutting features... highest dollar value of all

Hottest line in the industry, more Niagara Press Brakes are being bought today than ever before.

What's behind it? **Performance!** Downright, measurable, press brake performance! High hourly output with minimum operator effort is setting new work standards in plant after plant.

How about you? Want to sail through your schedules at record-breaking speed... cut your operating and maintenance costs to the bone... hold your capital investment to a **practical minimum... then Niagara is the press brake for you.**

Talk it over with a Niagara sales engineer. He has the facts to give you a fair comparison **...on every point.**

CIRCLE INFORM-A-GRAM KEY NO. 9

77 sizes to choose from

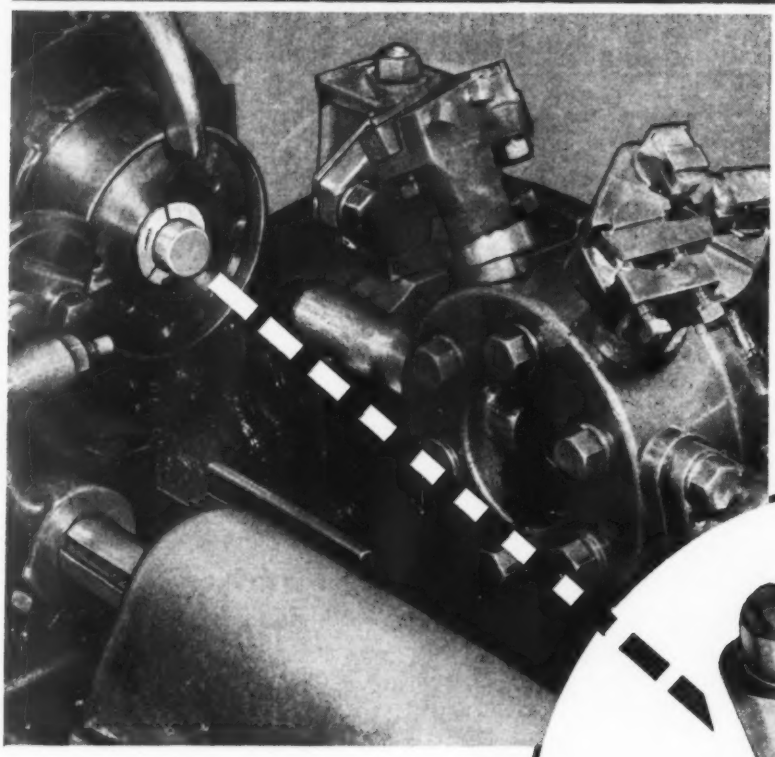
- 15-1500 tons
- Power or Manual Clutch
- Smooth, micro-inching ram
- Wear resistant, non-metallic ways
- Gearing enclosed in sealed oil bath

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

SALES OFFICES: Boston • Buffalo • Cleveland • Detroit • Indianapolis • New York • Philadelphia
Distributors in principal U. S. cities and major foreign countries

HARDINGE
ELMIRA, N.Y.

PRECISION PRODUCTS
for BROWN & SHARPE machines



COLLETS
FEED FINGERS
PADS

STOCK DELIVERY
FROM

Elmira, Boston,
Atlanta, New York, Hartford
Philadelphia, Portland, Seattle, Dayton,
Detroit, Minneapolis, Chicago, St. Louis,
Oakland, Los Angeles, Toronto

Order From **HARDINGE** Today

One Source of Supply Means Purchasing Economy

Write for FREE Bulletin B&S

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 10

Talk of the Month

Motivation In a Competitive World

by George E. Holbrook

MOTIVATIONS, as we know them, are both highly individualistic and collective. Those which result in individual stimulus are varied and complex, having their being in the personal ambitions, fears, pride, or other sensitivities of different personalities. Those which are of more general social applicability are those involving group loyalties, devotion to certain ideas or symbols, and dedication to established principles. Today we live in a world which has grown extremely complex. Loyalties and allegiances have become confused and tenuous, and time-honored principles are being brought into question as our values fluctuate. As a result our motivations are subject to shifts and counterplays, indifferent to established standards, and often inexplicable.

* * * *

If we are to compete successfully in this race for world leadership our motivations need realignment to a national objective. . . . It is the simple goal of survival as an economically strong, free nation.

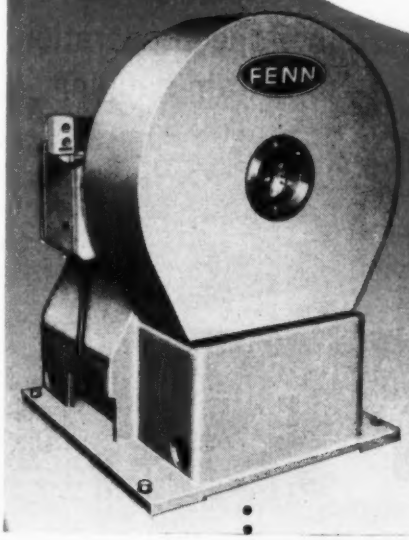
To this principle we must be firmly dedicated and toward this end all lesser objectives directed and coordinated. New technology, improved productivity, balanced budgets, lower taxes, more and better education, and other laudable objectives must be

Mr. Holbrook is Vice President, E. I. du Pont de Nemours & Co., Wilmington, Del. He delivered the talk from which this Talk of the Month is taken at the Southern Furniture Manufacturers' Association Annual Meeting.

Only Fenn MAKES ALL TYPES OF SWAGING MACHINES

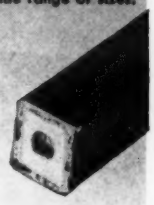
More and more precision metal forming operations are being performed on swaging machines because of low initial and low operating costs plus substantial savings in metals. Whether your specifications call for pointing, forming, assembling, internal reduction, or swaging squares and rectangles only Fenn offers you the model and size to exactly meet your requirements because *only Fenn makes all types of swaging machines.*

Write for Fenn Swaging Catalog!

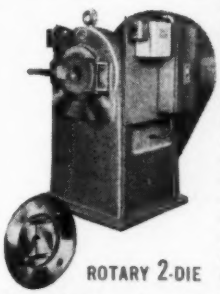


New! STATIONARY DIE SWAGING MACHINE

Newest addition to the most complete line of swaging machines. Ideal for use where it is desirable to keep work from rotating such as in swaging square and rectangular shapes. Inherent construction provides quieter operation and minimum operator fatigue. Available in wide range of sizes.

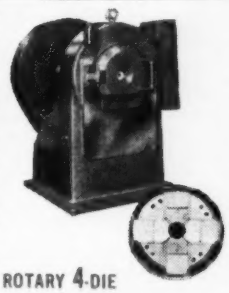


Square shaped heating element formed on Fenn Stationary Die Swager. Note round center element surrounded by compacted ceramic insulation.



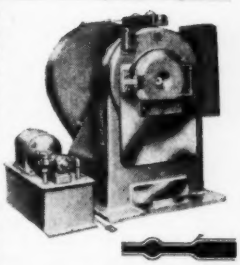
ROTARY 2-DIE

The workhorse of modern swaging machines and applicable to most swaging requirements. Low initial cost, wide range of sizes and capacities.



ROTARY 4-DIE

Ideal for swaging higher tensile materials, greater reduction per pass, and steeper angles of reduction. Also permits easy feeding.



HYDROFORMER

Equipped with special hydraulically actuated wedges that permit wide die opening. Used for internal and central reductions, and attaching fittings such as balls to cables.

FENN Sets the Pace IN SWAGING

THE FENN MANUFACTURING COMPANY • 402 FENN ROAD • NEWINGTON, CONN.

CIRCLE INFORM-A-GRAM KEY NO. 11

viewed as means to this end, for failure to achieve this broader goal will be disastrous.

As we survey our group motivations today we are impressed by the fact that all too frequently they are at cross-purposes. Instead of a barrage aimed at a common target, our salvo often resembles an explosion in a fireworks factory, with rockets and flares going off in all directions at once. There are many reasons for this, of course. They stem from growth, and complexity, and also from the fact that freedom does not breed homogeneity in motivation even though compatible with it.

* * * * *

The question is, how can we be assured of economic strength? The answer must inevitably lie in the motivating forces of our society which are now being diffused and neutralized by our failure to see and support national targets with the same clarity and fervor as we do more narrow objectives. In the interplay of business, labor and government we must therefore find common motivations — and do so before adversity itself provides too late the necessary national incentive.

. . . A business knows that it must achieve unity of purpose if it is to enjoy maximum success. It must reach a condition in which research, production, selling and staff functions share a collective responsibility to the organizations as well as to each other. On a broader scale, a nation is not greatly different.

In times of national emergency, it is relatively easy to achieve a high degree of dedication and resolution. It is one of life's ironies however that disaster should sometimes accomplish what prosperity, all too often, has set at naught. . .

. . . We must find the way to provide incentives and motivations to improve productivity and retain industrial leadership. To do so we need all the wisdom we can muster — wisdom such as Bertrand Russell characterized as consisting not "of knowledge alone, or of will alone, or of feeling alone, but a synthesis and intimate union of all three."

* * * * *

As we measure the effect of decisions on individuals and groups, the time has arrived when we must concern ourselves even more with the effect of those decisions on the economic and moral strength of the nation. This can be done, and must be done, within the framework and philosophy of our political system that protects the individual's right to Life, Liberty and the pursuit of Happiness. If we are to protect those rights, however, we need to remember that rights are inevitably accompanied by responsibilities, privileges by duties. If we neglect the one, we shall beyond question lose the other.

New cam-lever linkage of the Di-Acro Model 36 shear provides a greater mechanical advantage than lever actions. This makes it easier to control both machine and material so that operation is easier, faster and safer.

Quick-Set micrometer gauges set to hair-line accuracy in seconds. The new Model 36 shear is fast to set-up, fast to operate. To maintain tolerances to thousandths of an inch, an automatic hold down bar grips materials during shearing. Notching and slitting can be done easily by setting the adjustable ram stops to limit stroke length. Capacity of the machine is 16 gauge steel.

Steel, rubber, mesh and all shearable sheet materials (even some plastics) can be cut to die-accuracy with the new Model 36.

Similar performance is also delivered by a range of other models down to 6 inches in width. For detailed information, call your Di-Acro distributor who is listed in the yellow pages of your phone book under Machinery—Machine Tools, or write us.

DI-ACRO POWER SHEARS. Di-Acro Shears of 12" and 24" widths are available in power models. The standard model provides continuous and single stroke operation. Vari-O-Speed model shears automatically at a range of speed from 30 to 200 R.P.M. or single stroke.

di-acro PRECISION METALWORKING MACHINES

Find Us Fast in The Yellow Pages

O'NEIL-IRWIN MFG. CO.
315 8th Ave. • Lake City, Minn.
pronounced "die-ack-ro"

CIRCLE INFORM-A-GRAM KEY NO. 12

COOPERATIVE CREATIVE-ENGINEERING

• COOPERATION IN IDEAS

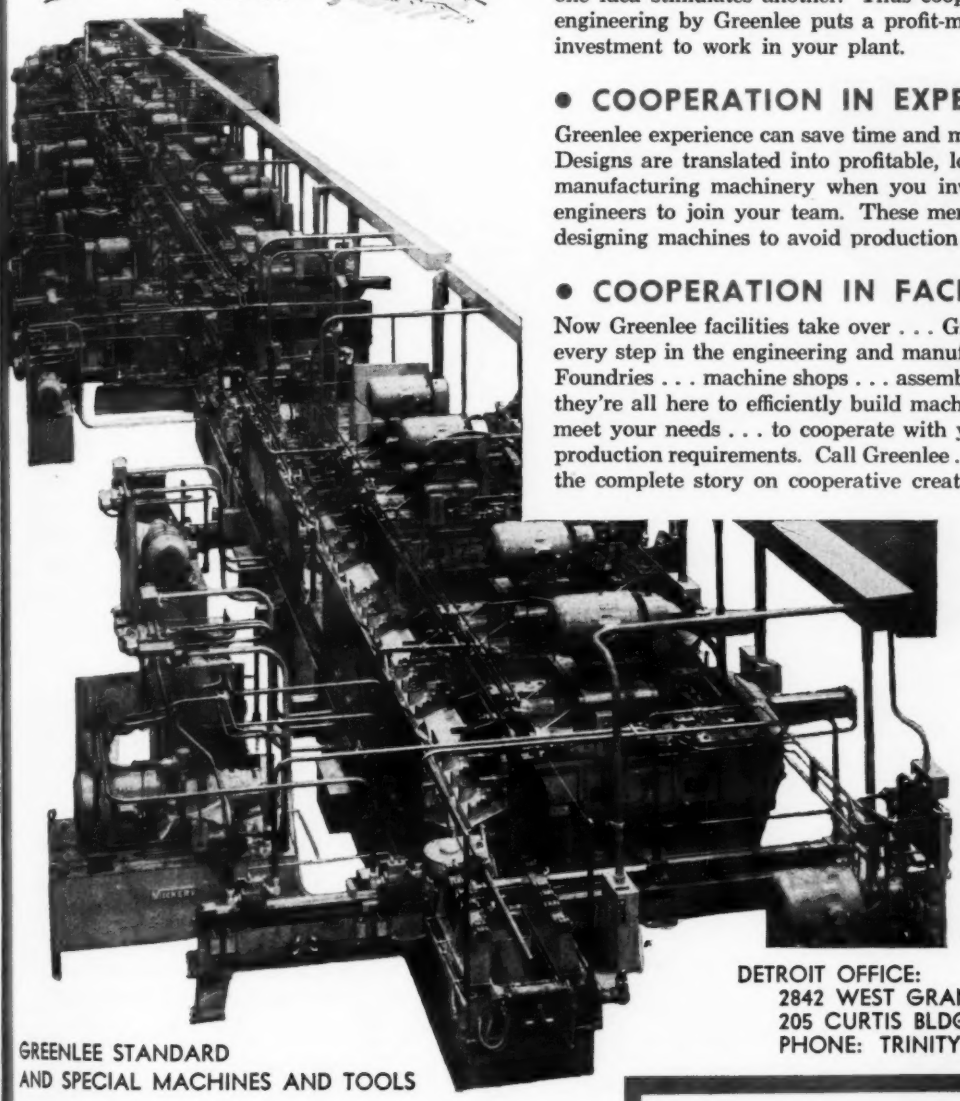
Greenlee engineers work with your men at all levels of management, production, and engineering. They gather and exchange information based on broad experience. These contacts accelerate creative thinking . . . one idea stimulates another. Thus cooperative creative-engineering by Greenlee puts a profit-making investment to work in your plant.

• COOPERATION IN EXPERIENCE

Greenlee experience can save time and money in your plant. Designs are translated into profitable, low-cost manufacturing machinery when you invite Greenlee engineers to join your team. These men know the art of designing machines to avoid production problems.

• COOPERATION IN FACILITIES

Now Greenlee facilities take over . . . Greenlee controls every step in the engineering and manufacture of machines. Foundries . . . machine shops . . . assembly floors . . . they're all here to efficiently build machines to meet your needs . . . to cooperate with you in meeting production requirements. Call Greenlee . . . let them give you the complete story on cooperative creative-engineering.



PRODUCTION MACHINERY
GREENLEE

DETROIT OFFICE:
2842 WEST GRAND BLVD.
205 CURTIS BLDG.
PHONE: TRINITY 2-3938

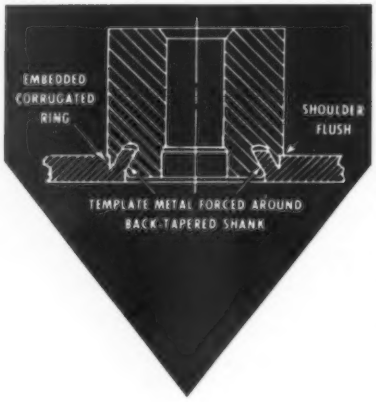
GREENLEE STANDARD
AND SPECIAL MACHINES AND TOOLS

- Transfer-Type Processing Machines
- Multiple-Spindle Drilling and Tapping Machines
- Six and Four-Spindle Automatic Bar Machines
- Die Casting Machines and Trim Presses
- Hydro-Borer Precision Boring Units
- Core Box Handling Equipment for Foundries
- Specialized Woodworking Machines
- Hand Tools for Woodworking
- Tools for Woodworking Machines
- Hydraulic Tools for Electricians, Plumbers, Contractors

Machines designed with the future in mind

GREENLEE
BROS. & CO.
1747 MASON AVE.
ROCKFORD, ILLINOIS

"WHERE have these Template Drill Bushings been ALL MY LIFE"



Bushings that save their cost—and pay a bonus to the user in simplified template assembly.

That's the PEM Story.

One-hole, compression-mounting positively locks bushings into the template metal with high torque and pull-out resistance.

Any standard press can be used to supply the squeezing action required to install one or several at a time.

There's no riveting, welding, indexing, nesting, outboard supports needed. No possibility of "cocking" during installation.

Permit thinner gauge (one-third conventional thickness), lighter weight, easier-to-handle templates.

Try PEM Bushings and you will wonder, too, where they've "been all *your* life."

Write for literature and sample.

PEM

PENN ENGINEERING & MANUFACTURING CORP.
DOYLESTOWN, PENNSYLVANIA

CIRCLE INFORM-A-GRAM KEY NO. 14

MANUFACTURING MEMOS

Testing Classes . . . Quality control supervisors, inspectors, and operators have been traveling to the Magnaflux Corp. in Chicago during the last year for a five-day training course in nondestructive testing. Its basics, theory, and practice are presented in laboratory sessions, class discussions, and lectures. For information, write the company at 7300 W. Lawrence Ave., Chicago 31.

Fast Delivery . . . "Off-the-shelf" delivery of popular sizes and types of basic standard precision finishing machines from Heald Machine Co. now is just as simple as ordering a keg of nails. Because they don't have to start from scratch when your order comes in, you'll only wait from two days to two weeks for delivery.

Diamond Costs . . . Man-made diamonds are no longer the expensive, rare items they once were. "Now the customer pays his money and takes his choice," says Fred Scott, Jr., sales manager for Carborundum's Bonded Abrasives Division. "There is no price differential, but, in the matter of performance in the grinding of carbides, man-made diamonds are a standout."

PMI Award . . . For contributions to enlarging the field of metal stampings, Frederico Strasser of Santiago, Chile, received the 1959 Presteel Award of the Pressed Metal Institute.

Hours on High . . . Over a million flight hours have been chalked up for high-performance jet engines using components made of titanium, says Pratt & Whitney Aircraft. And in this time not a single failure of any titanium part has been found on their 5800 type engines.

Future Building . . . Two more firecrackers are being added to the building boom. The Timken Roller Bearing Co. has alloted $5,250,000 for a new railroad bearing producing facility in its Columbus Railroad Bearing Plant. In West Memphis, Ark. The Bellows Co., Valvair Corp., and Sinclair-Collins Valve Co., which make up the Fluid Power Divisions of International Basic Economy Corp., are rolling with plans for an assembly plant.

THIS PIN ENDS DIE SET SMASH-UPS IN CASE OF PIN SEIZURE

SUPERIOR'S *Exclusive* REMOVABLE CAP PINS

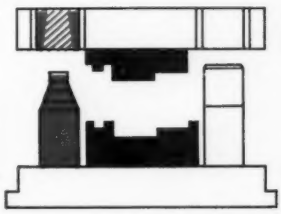
Now costly die set smash-ups can be avoided with Superior's removable cap pins.

In the event that foreign matter causes pin and bushing seizure . . . the socket screw pulls out of the retaining washer, then the matching taper of pin and cap act as a guide, preventing costly die damage as the punch holder is lowered by the press.

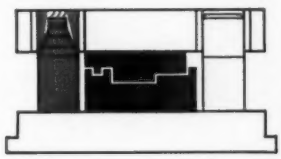
A new cap is merely substituted and the die set is ready for production. (Precision manufactured of removable cap pins permits interchangeability of caps.)

In addition, Removable Cap Guide Pins eliminate punch holder binding on guide posts when parting dies. The cap is removed from the pin merely by loosening a socket head screw which holds the cap in place. This frees the punch holder at the most critical point of the pin where it is apt to cock or bind.

Matching Taper and Cap act as guides prevent costly die damage



Note how cap tears loose in event of pin seizure other pin remains intact.



As punch holder is lowered in press, cap and pin act as guide. Replacing pin with a new cap puts die back into operation in minutes.

NOW on every Superior Die Set in diameters from 1½" upward at no additional cost.

Write for your free 28 page catalog on Superior die sets and supplies.

Case histories where die set smashups were avoided with removable cap pins furnished upon request.

SUPERIOR
STEEL PRODUCTS CORP.

2754 SO. 19th ST., MILWAUKEE, WIS.

Representatives in these Principal Industrial Centers

Cedar Rapids, Iowa
Empire 2-7831

Chicago, Illinois
Off.: Randolph 6-8871
Res.: Keystone 9-9800

Dayton, Ohio
Baldwin, 2-6209

Denver 1, Colorado
Enterprise 234

Pittsburgh, Pa.
Tuxedo 4-4040

Indianapolis, Indiana
Clifford 5-5668

Lansing, Michigan
Iv-9-0214

Memphis, Tennessee
Fairfax, 3-7727

Rockford, Illinois
Off.: 9-9331
Res.: 7-9403

Fairfield, Conn.
Edison 4-4282

St. Louis, Missouri
Jefferson 5-1223

Bradenton, Florida
5-9661

Minneapolis, Minn.
Fr. 1-1321

Racine, Wisconsin
Melrose 2-1900

Warwick, R. I.
Turner 4-2907

Melrose Park, Illinois
Filmore 5-5910

Syracuse, New York
Granite 4-0458

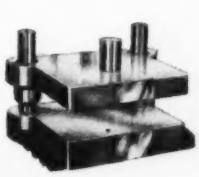
Cheshire, Conn.
Browning 2-4887

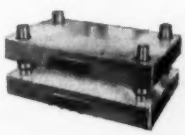
West Newton, Mass.
Bigelow 4-2070
Bigelow 2-6771

Union, N. J.
Murdock 8-2270

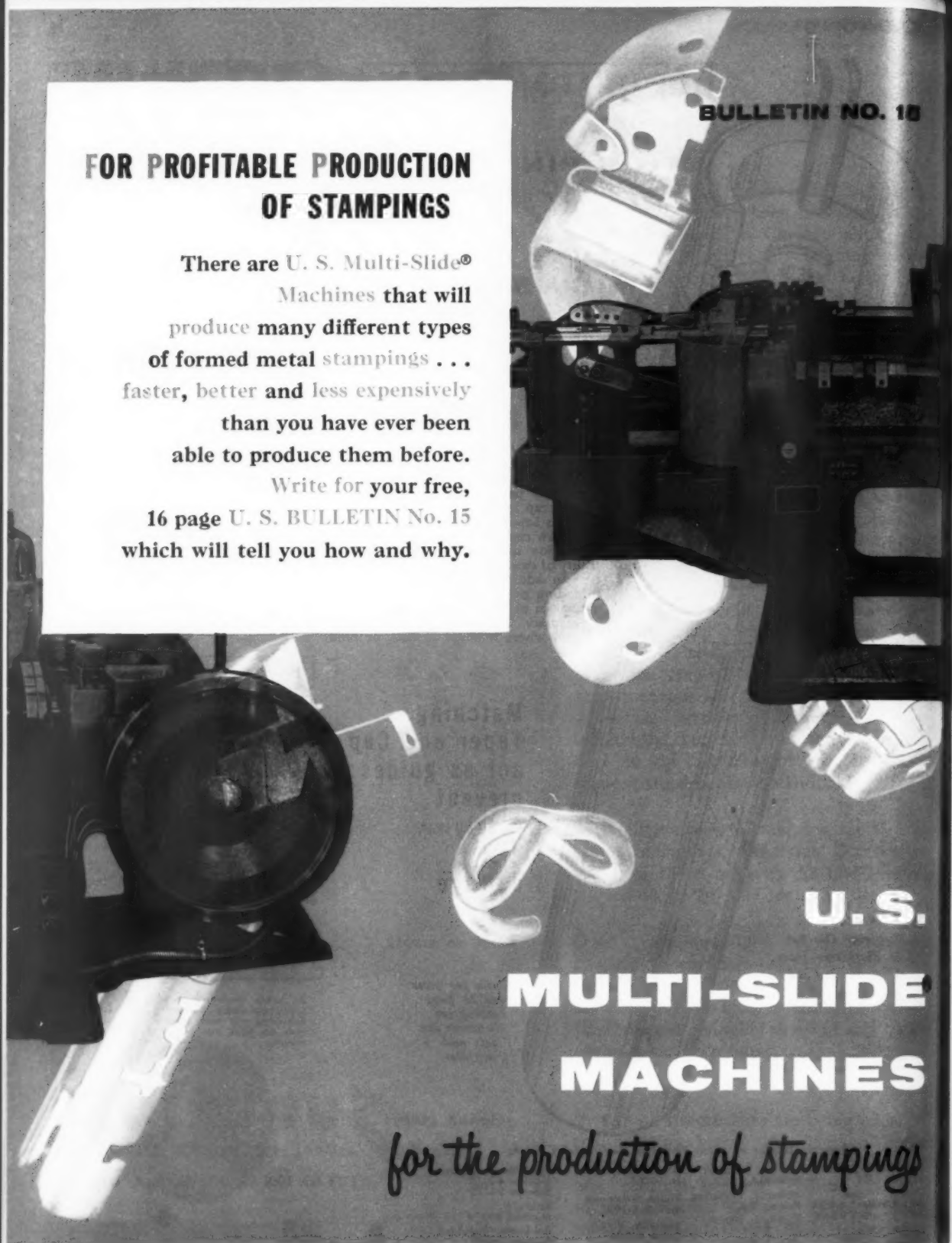
Baltimore, Maryland
Belmont 5-2780
Belmont 5-9492

2 plants to serve you
Milwaukee, Wisconsin
Mitchell 5-6027
Plainville, Conn.
Sherwood 7-2761





CIRCLE INFORM-A-GRAM KEY NO. 15


BULLETIN NO. 15
FOR PROFITABLE PRODUCTION OF STAMPINGS
There are U. S. Multi-Slide® Machines that will produce many different types of formed metal stampings . . . faster, better and less expensively than you have ever been able to produce them before. Write for your free, 16 page U. S. BULLETIN No. 15 which will tell you how and why.
U. S.
MULTI-SLIDE
MACHINES
for the production of stampings

PRODUCTS

U. S. TOOL COMPANY, INC.

AMPERE 4 (East Orange) NEW JERSEY

U. S. Multi-Slides® • U. S. Multi-Millers® • U. S. Automatic Press Room Equipment • U. S. Die Sets and Accessories

CIRCLE INFORM-A-GRAM KEY NO. 16

MANUFACTURING MEMOS

Research Boom

Evidence that more dollars are being spent on research has been turned up by American Management Association Budgets for almost 600 companies are 12% higher this year than in 1958, with over 64% of these upping allotments for research.

Acquisitions

Michigan Tool Co. has purchased Gear Grinding Machine Co. and has established a new Gear Grinding Machines Division.

The Jackson Electronic & Mfg. Co. is now a part of The Bellows Co., Division of The International Basic Economy Corp.

International Electronics Industries, Inc. has joined Standard Pressed Steel Co.'s group.

Two in One

The merger of Allen Plastics and Allen Wood Model and Pattern Inc. has been made known. It's now called Allen-Hayosh Industries, Inc.

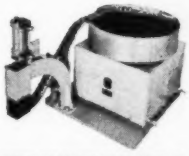
Representatives

Lakeshore Machinery & Supply Co. and Montague-Harris & Co. are now representatives for Verson Allsteel Press Co.

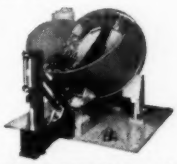
Ampco Metal, Inc. has named New York Brass & Copper Co., Inc. to service the Metropolitan New York and New Jersey area.

White Bros. Co. of Walla Walla, Wash. is now serving Adamas Carbide Corp.

In Pittsburgh The McBeth Machinery Co. represents Telecontrol Div'n, Hancock Industries, Inc.



VIBRATORY FEEDER for light, fragile or highly finished parts.



ROTARY FEEDER for high production feeding.

ROTARY HIGH SHELL FEEDER for maximum holding capacity.

Shuffle and deal parts for automatic assembly with

DPS selective feeders

It takes fast, automatic feeding to satisfy the appetites of today's automatic assembly machines. And nowhere can you duplicate the range of equipment, the specialized experience in selective feeders offered by Detroit Power Screwdriver Company.

The most complete line in industry, DPS parts feeders include rotary, vibratory and elevator types. They handle any product from the tiniest of screws to assembly components the size of your fist . . . range in holding area from eighty cubic inches to 20 cubic feet.

DPS will welcome an invitation to analyze your assembly operations. If lagging production can be traced to inefficient feeding, the problem is as good as answered. Write for catalog on selective feeders.

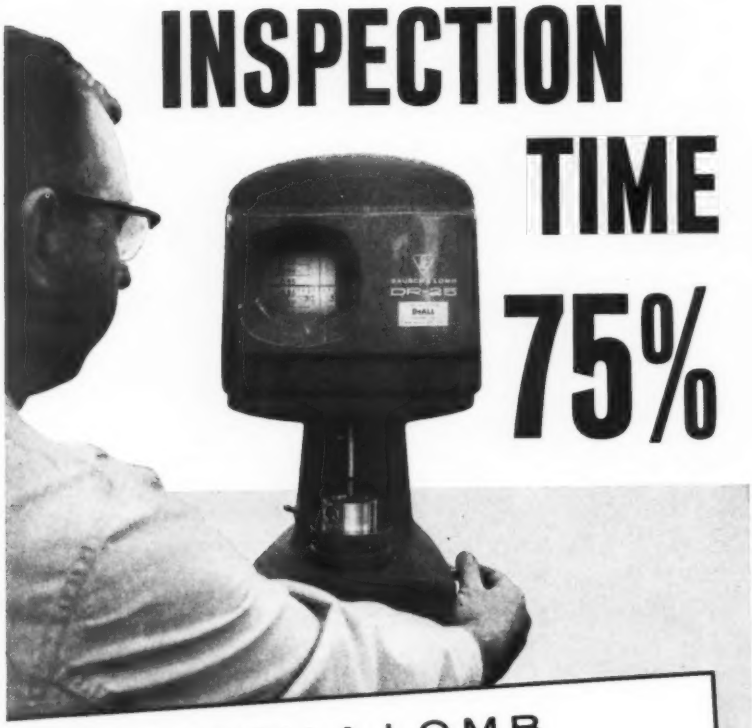
DETROIT POWER SCREWDRIVER COMPANY 15.036

2827 W. Fort St. • Detroit 16, Michigan

A Subsidiary of Link-Belt Company

CIRCLE INFORM-A-GRAM KEY NO. 17

CUTS INSPECTION TIME 75%



BAUSCH & LOMB

DR-25

OPTICAL GAGE

- DIRECT SCALE READING TO .0001"
- 0" TO 3" RANGE WITHOUT GAGE BLOCKS

"The new Bausch & Lomb DR-25 Optical Gage has let us cut total inspection and measurement time on our Teledyne Electrical Transmitters—high-precision gages to register and relay pressure data for telemetric readings—by at least 75%. We find that we no longer need gage blocks and special gages to meet our very rigid specifications."

Joseph F. Less, Plant Manager
Taber Instrument Corporation
North Tonawanda, N. Y.

Distributed in the U.S.A. through the DoALL Co.

BAUSCH & LOMB OPTICAL CO.
77347 Bausch St., Rochester 2, N.Y.

☐ I'd like an on-the-job demonstration of a B&L DR-25 Optical Gage. No cost, no obligation.

☐ Please send Catalog D-285.

Name, Title .....
Company .....
Address .....
City ..... Zone ..... State .....

Find out more about cutting inspection time and costs... MAIL COUPON TODAY

BAUSCH & LOMB

CIRCLE INFORM-A-GRAM KEY NO. 18

MANUFACTURING MEMOS

New Offices

A new company office has been opened in Detroit by Verson Allsteel Press Co., with Paul W. Eckstein as manager.

Precision Extrusions, Inc.'s new Indianapolis office now handles expanded sales and service.

Coming Events

Nov. 2-6. American Society for Metals' 41st National Metal Exposition & Congress, International Amphitheatre, Chicago.

Nov. 2-6. Society for Nondestructive Testing's 19th Annual Conference, Hotel Hamilton, Chicago.

Nov. 3-4. Industrial Management Society's 3rd Annual "Executive Techniques for Industrial Engineering" Seminar, Conrad Hilton Hotel, Chicago.

Deaths

William Spencer Bowen, 73, founder of Bowen Engineering Inc., died August 11 in Muhlenberg Hospital, Plainfield, N. J.

Charles Herman Reynolds, 68, retired vice president and former member of the board of directors of The Sheffield Corp., died August 31 of a heart attack in Brutus, Mich.

Rimmler PMI Prexy

The Pressed Metal Institute recently elected the following officers to serve during the coming year: F. F. Rimmler, Volkert Stampings, Inc., president; M. A. Sherwood, Grand Haven Stamped Products Co., and W. J. Primrose, Jr., The Dickey-Grabler Co., vice president; Melvin Loretz, HPL Mfg. Co., secretary-treasurer; and W. Bryant Gemmill, American Stamping Co., honorary secretary-treasurer.

CUT COSTS

with the Original Mead

MIDGET AIR CLAMP

(Spring Return Air Cylinder)

In assembly jigs and other multiple applications, this new, low cost pressure unit saves countless man-hours. As a work-ejector in many fixtures, it is unexcelled.

Advantages over mechanical clamps

1 All Air Clamps in any set-up can be operated by a single master valve—the "lock-up" and release of assemblies is instantaneous.

2 May be installed in cramped corners difficult to reach with bulky mechanical clamps. Mead Midget is the most compact air cylinder, for its power, on the market.

3 Equal ram pressure at any point along stroke, making special, delicate adjustments unnecessary.

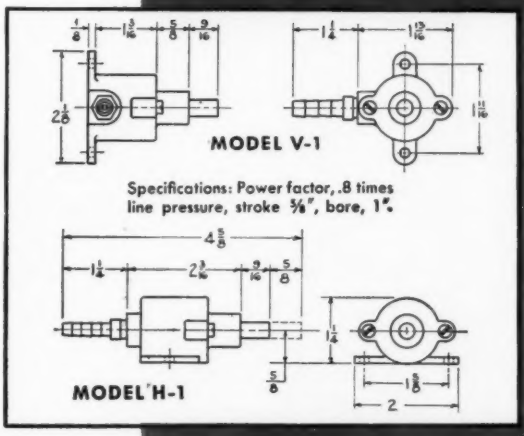
4 Independent group control. Any desired group of "Midgets" can be controlled independently of any other group in an assembly—as where primary members of the fixture must be locked up before the secondary members.

5 Facilitates delicate drill operations. Air Clamps actuated by foot control valves leave operator's hands free to handle the work pieces.

Send for all the interesting facts on these time-tested, superior Midget Air Clamps.

MEAD SPECIALTIES COMPANY

4114 North Knox Avenue • Dept. P-77 • Chicago 41, Illinois



IMMEDIATE DELIVERY

Single-acting cylinders delivered from stock; double-acting in a few days.

Turn Out MEMO Coupon Now For

New MEAD INDUSTRIAL AIR POWER CATALOG

Full of suggestions for faster, cheaper production with famous MEAD AIR-POWERED Cylinders, Valves, Presses, Vises, Chucks, Hammers, Drill Press Feeds, Work Feeders, semi-automatic combinations, etc. Send today.

Memo Coupon

MEAD SPECIALTIES CO.
4114 N. Knox Ave., Dept. HA-119, Chicago 41, Ill

Send free copy of new, colored MEAD INDUSTRIAL AIR POWER CATALOG describing the complete line of famous Mead air-operated devices.

Name_____

Company_____

Address_____

City_____ Zone____ State____

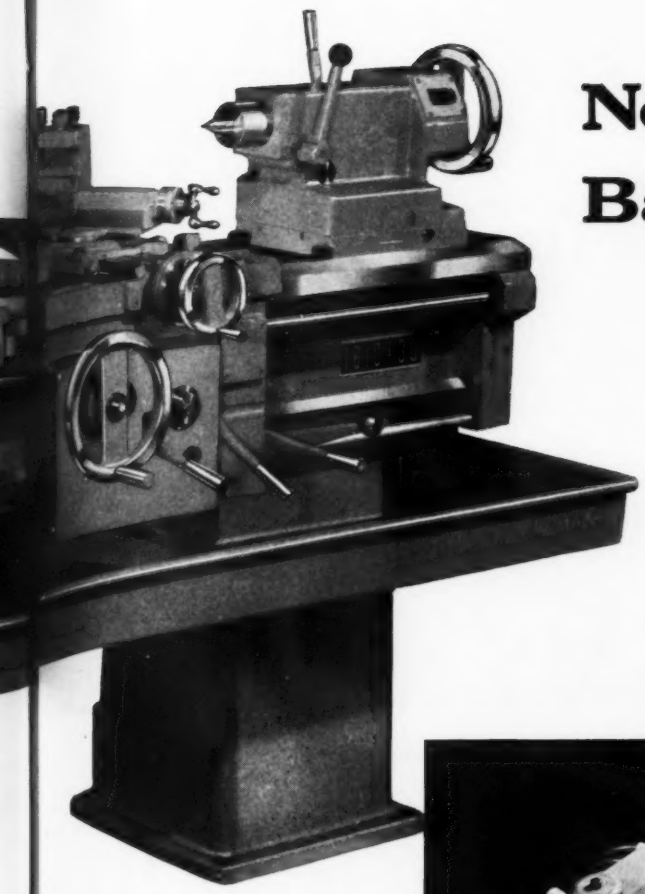
CIRCLE INFORM-A-GRAM KEY NO. 19

The new Barber-Colman Model 1610 Facing and Turning Lathe is designed specifically for facing, turning, and boring. It is highly economical for either toolroom or production work.

This lathe has no threading equipment. This means more lathe per dollar for your facing and turning work. It can be furnished with a front-mounted tracer that is ideally suited for both small-lot and high-production turning. Either 16″ or 20″ swing over the bed ways is available.

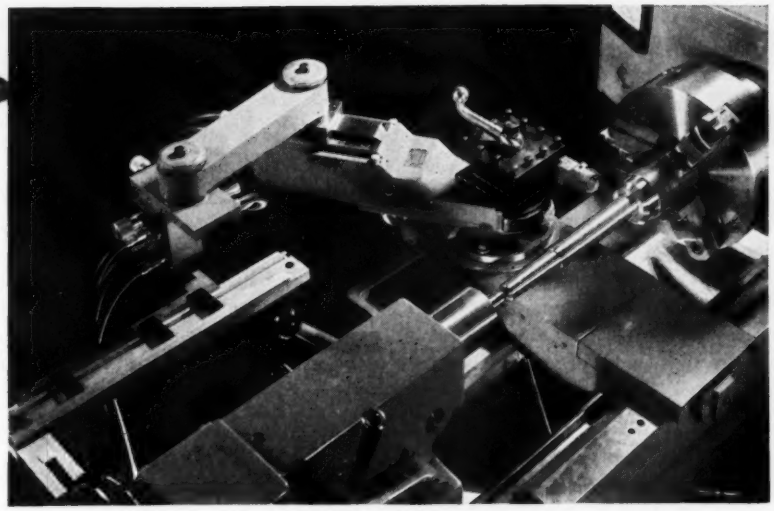
Today, a high percentage of lathes are used only for facing, turning, and boring. Thus, elimination of threading equipment and the gear box permits a sizable saving in purchase price with no practical loss of utility. You get a low-cost precision lathe capable of producing toolroom accuracies easily.

Elimination of the gear box permits infinitely variable feed. Feed rate is changed simply by turning a dial on the headstock. It can be as fine as .0001″, depending upon spindle speed. Spindle speeds also are infinitely variable. Maximum speed can be 1500, 2000, or 2500 rpm. The drive motor is 6.5 hp.



New Barber-Colman Lathe

Model 1610 Facing and Turning Lathe . . . 16" or 20" Swing



Model 1610 Lathe with front-mounted tracer unit.

Other important features include automatic carriage stops with a 5-position turret stop, and a tailstock travel counter.

The simple hydraulic tracer is easy to mount, easy to set up, and easy to operate. Stepped diameters, 90° faces, chamfers, contours, and tapers all can be turned at the lowest possible cost. The tracer is front-mounted and uses a flat template. With it, parts can be turned easily within .001" on diameter and .001" on length. Swing over the cross slide with tracer is 10" on the Model 1610 and 13" on the Model 1610-13.

Ask your Barber-Colman representative about the complete features of this new practical kind of lathe. Or write direct to the factory for more information.

CIRCLE INFORM-A-GRAM KEY NO. 21

Barber-Colman Company

BARBER COLMAN ®

117 LOOMIS STREET, ROCKFORD, ILLINOIS

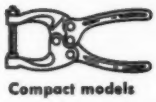
NEW 2-WAY TRIGGER RELEASE

Model 462 illustrates how only one hand easily releases clamp by pressing trigger toward either handle. This patented feature available on many De-Sta-Co Portables.

IF YOU CAN REACH IT— A DE-STA-CO Portable Will Clamp It!

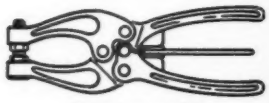
Hundreds—yes, thousands—of awkward clamping problems have been brought to us for solution in our 40 years of leadership. Many of these have been solved by De-Sta-Co Portable Clamps. You now have a selection of two dozen basic models, a variety which masters almost any conceivable portable, blind or awkward clamping operation. To add to the versatility of all our portables, there's a complete line of accessories. Features which may aid you in your next problem are

1. ***Two way trigger releases*** **on numerous models**
2. ***Deep jaws and wide spans***
3. ***Flexi-matic and Pressure-matic spindle adjustments***
4. ***Non-magnetic materials*** **for the special application**
5. ***Light weight models*** **for continuous frequent handling**

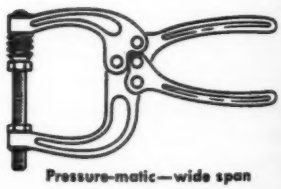


Compact models

Self-adjusting models



Deep jaw models



Pressure-matic—wide span

De-Sta-Co Portables lend themselves to special adaptations for that "insurmountable" problem.

Standard portables offer jaw openings ½″ to 6″, throat depths to 3½″, pressures from 35 lb. to 1200 lb.

Send for the De-Sta-Co catalog with details on over 130 types, sizes and models of portable and *fixture* clamps. We'll send you the name of our stocking distributor in your area. He is ready and qualified to assist you with your clamping problem.

De-Sta-Co is widely known for toggle clamps, stampings, precision washers, spacers, shims, shim and feeler stock, blower housings and marine specialties.

DE-STA-CO

DETROIT STAMPING COMPANY

344 MIDLAND AVENUE • DETROIT 3, MICHIGAN

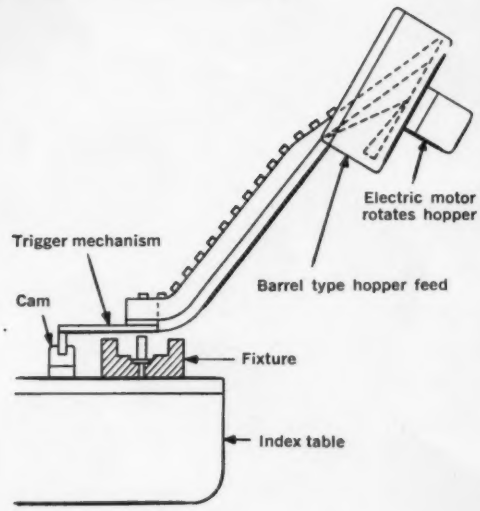
This packaged potential for complete automation requires only proper tooling to make it 100% automatic. Retooled for specific jobs its usefulness can be extended many times.

PRACTICAL AUTOMATION UNDER $10,000

Eliminates Parts Handling, Eliminates Manual Skill

Both quality and production output benefit when the H-P-M automatic index table is put to work. With all press motions easily preadjusted for correct pressure, stroke and ram speed, the uniformity of force applied to finished parts is removed from the realm of guesswork. With automatic loading of parts for many small assemblies, manual effort is removed from the job. These two elements, in combination, assure better quality, faster production at lower cost.

The H-P-M C-Press is available in 5, 10, and 15-ton models for the bulk of mass produced assembly work in your shop. Let an H-P-M field engineer explain how low cost automation with H-P-M's can be put to work for you; how this initial investment in modernization can be applied and reapplied to countless production tasks.



Many small parts can be hopper fed as typified in this sketch. Eliminate the fumbling and slowdown of feeding small parts manually and your production will improve by "hundreds" per day.

H945

THE HYDRAULIC PRESS MFG. COMPANY
A Division of Koehring Company, Mount Gilead, Ohio, U.S.A.

CIRCLE INFORM-A-GRAM KEY NO. 23

Through each and every stage in the manufacture of a Pipe Machinery gage, our operators feel a very real —a very personal responsibility for the quality of the product they are helping to produce.

Supporting this meticulous operator control of quality is individual operator inspection equipment and our own air conditioned inspection laboratory. Here gages are subjected to further rigorous examination by alert and vigilant technicians employing a battery of modern instruments such as the length measuring machine shown below (used to check internal and external diameters).

For further information, send for our #11 catalog, or better yet, stop in and visit us next time you're in the area. We'd be proud to show you personally how rigid inspection methods help make Pipe Machinery gages outstanding.

At PIPE MACHINERY–

Rigid Inspection Methods Leave Nothing To Chance

THE PIPE MACHINERY COMPANY · 29100 Lakeland Boulevard · Wickliffe, Ohio · Greater Cleveland

CIRCLE INFORM-A-GRAM KEY NO. 24

The Carpenter Steel Co. recently promoted **Donald F. Ross** to Dayton - Cincinnati district manager.

The Heald Machine Co. appointed **Frederick J. Underwood,** branch manager in Syracuse; **Richard A. Masters** and **Ernest I. Nielsen,** assistants; **Albert F. Buckley,** Philadelphia district director; and **Donald B. Sampson,** sales engineer in Cleveland.

Newly appointed vice president in charge of manufacturing for Beaver Tool and Engineering Corp. is **Albert Iacco.**

George P. Burns has taken over as sales manager-machine tools for the Van Norman Machine Co.

Gisholt Machine Co. recently announced that **William Nyberg** is district manager of Pittsburgh sales office; **R. H. Presnall,** assistant sales manager at Gisholt, Madison; and **R. H. Stebbins,** sales manager.

John F. Griffey now serves as sales engineer in the midwest, **James R. Holmin** goes to the east, and **Ray W. Kiefer** is office service manager for Sundstrand Hydraulics, Division of Sundstrand Corp.

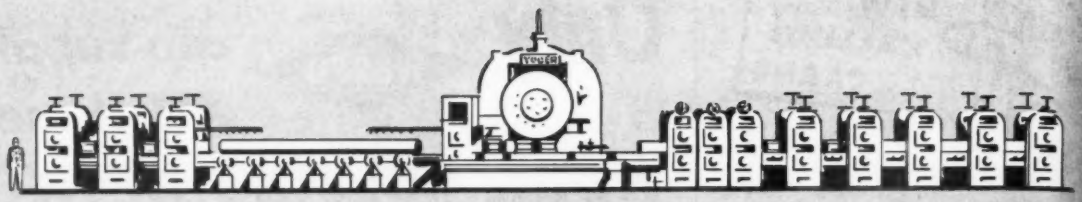
New assistant sales manager for The Weldon Tool Co. is **S. E. Smith.**

Promotion of **M. L. Backstrom** to sales development engineer and **A. G. Weiland** to Chicago district manager, Carbide Division, have been announced by Firth Sterling Inc.

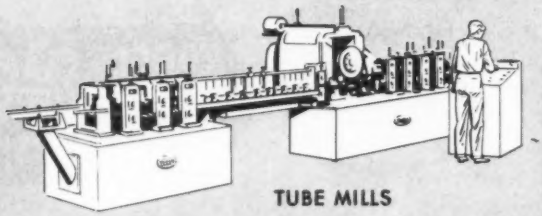
Recent appointments at Buhr Machine Tool Co. include **Chester S. Johns,** general sales manager, and **Walter R. Naas,** sales engineer.

Two new sales engineers for Wesson Co. are **Herbert D. Groth** and **James Walsh.**

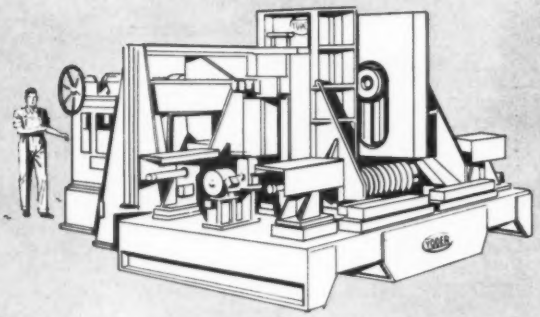
CIRCLE INFORM-A-GRAM KEY NO. 25



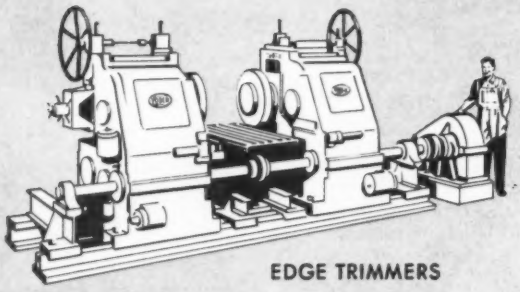
PIPE MILLS



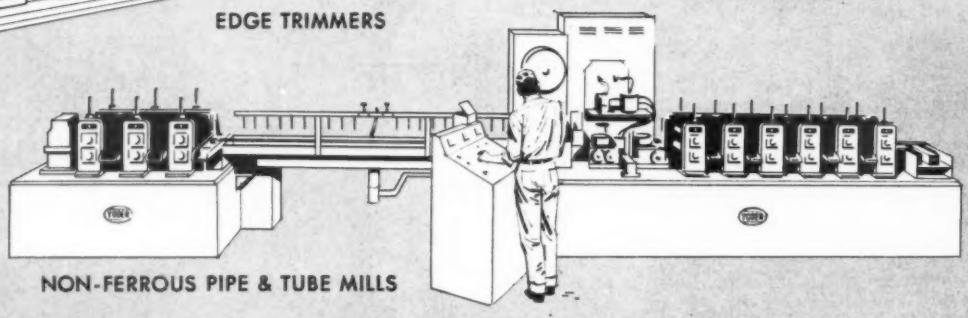
TUBE MILLS



HEAVY DUTY UNCOILERS



EDGE TRIMMERS



NON-FERROUS PIPE & TUBE MILLS

YODER PIPE AND TUBE MILLS

Today's expanding markets and tightening economy demand closer production cost control. YODER'S complete line of ferrous or non-ferrous Pipe and Tube mills can help you meet production schedules economically... help you realize significant savings in the manufacture of tube and pipe.

YODER Pipe and Tube mills offer flexible production to meet fluctuating demand. They adapt easily to the most rigorous schedules. Everyday manufacture of constant high quality pipe and tube in diameter of 5/16" to 24". Speeds up to 350 fpm plus can be obtained with YODER mills.

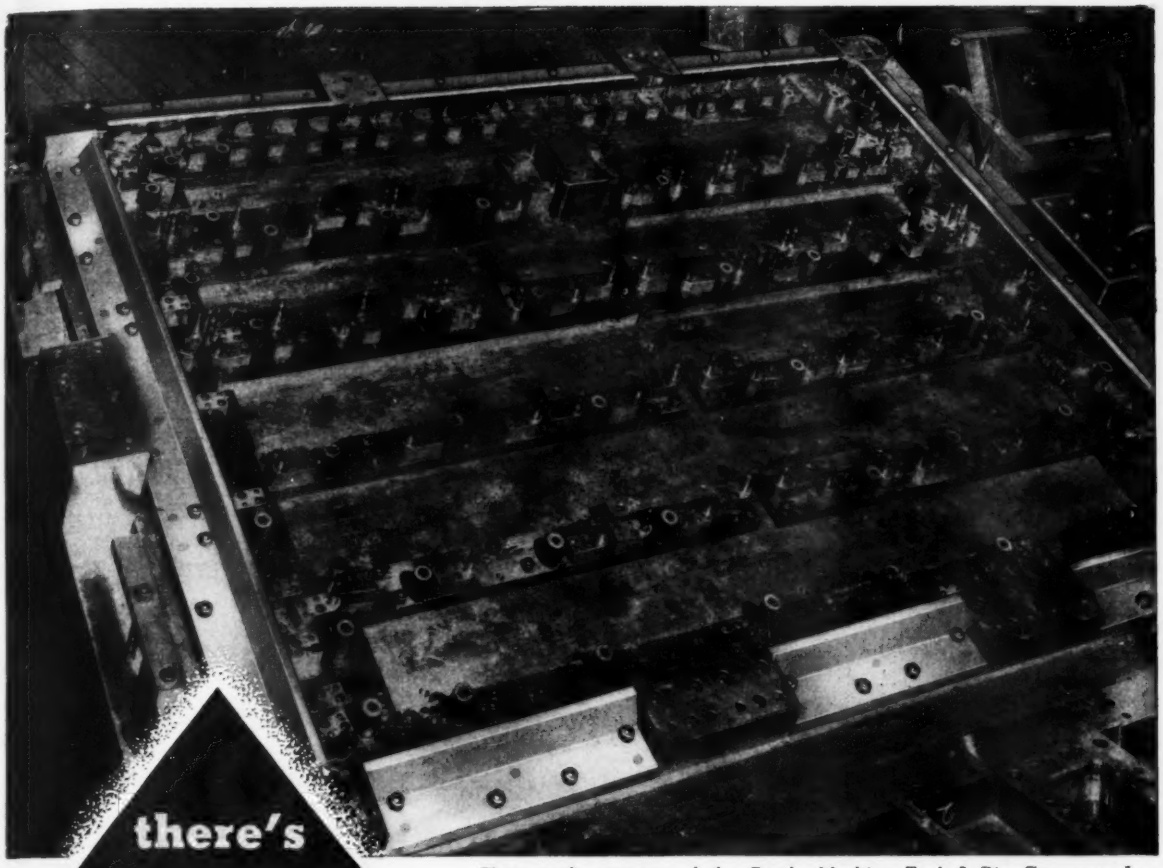
YODER also makes a complete line of Slitting equipment and Cold Roll-Forming machinery. Send for your copy of the fully-descriptive book covering Tube Mill operation.

THE YODER COMPANY
5501 Walworth Ave. • Cleveland 2, Ohio

ENGINEERING **YODER** MANUFACTURING

PIPE AND TUBE MILLS (ferrous or non-ferrous)
COLD ROLL FORMING MACHINES
ROTARY SLITTING LINES

CIRCLE INFORM-A-GRAM KEY NO. 26

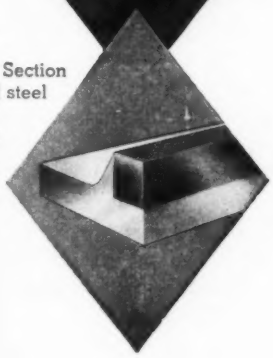


Photograph courtesy of the Ready Machine Tool & Die Company, Inc., Connersville, Ind. shows Ohio Knife Co. Composite Die Sections on a blank and pierce die for a 4' x 6' refrigerator inner food compartment.

there's a NEW way to build your dies

it saves you time and money

OK Die Section shows tool steel clad to mild steel backing.



You simply order from our large stock of Composite Die Sections. They are cut to your required length or in bars 125" long. There are eleven standard cross sections with both wide and narrow lands available.

You buy them at a price far below what it's costing you to make them yourself.

You receive them with cutting or forming edge already hardened, machined and ground. The soft steel backing, to which our specially hardened tool steel is clad, can be drilled quickly and economically for dowel and screw holes. Adjustments for wear are equally simple.

Hundreds of companies who have switched to OK Composite Die Sections available for Cutting, Trimming and Forming Dies, report great time and money savings, plus longer die life. For new bulletin on OK Composite Die Sections and Clad Aluminum Bronze Wear Plates, write Dept. 47-LL.

Manufacturers for the Metal Working Industry of:

Composite Die Sections . Bronze Ways . Wear Strips
Shear Blades . Slitter Knives . Work-Rest Blades
Cut-off Blades . Hardened Ways . Hardened Spacers

THE OHIO KNIFE CO.

CINCINNATI 23, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 27

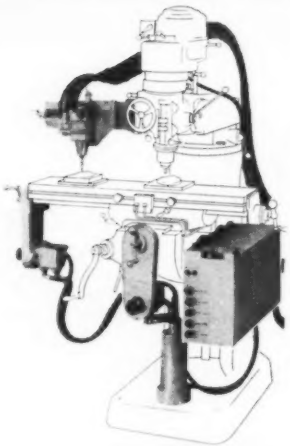
SYNCHRO-TRACE—FULLY AUTOMATIC 3D PROGRAMMED CONTROL SYSTEM CUTS COST OF DIES, MOLDS AND CONTOURED PARTS BY OVER 50%.

Now—Produce dies, molds and contoured parts faster, with greater accuracy using Synchro-Trace duplicating attachment with your milling machine. Synchro-Trace fully automatic operation allows operator, formerly required, to perform other important duties. Costly benching time reduced as much as 50% due to uniform feed rate, high tracer accuracy, and the even amount of "pick" with each pass of the cutter. Accurate estimates of machining time required may be made, as cutting path, feed, and amount of cut are pre-determined for every pass of the cutter.

Synchro-Trace will duplicate any shape of part—even 90° walls. Other features include "pick" feed in either direction, fixed stylus oversize, automatic shutdown, plus many others.

Synchro-Trace may be purchased as original equipment on new mills or adapted to existing tool room, production, and planer type milling machines.

Contact your nearest True-Trace dealer or direct factory branch plant TODAY for further information on how Synchro-Trace can cut your 3D contouring cost.



For complete data write for new illustrated brochure #STM-1 today. Dept. TP

TRUE-TRACE
SALES CORPORATION

9830 Rush Street, El Monte, California
Branch Plants: 35 Urban Avenue, Westbury, Long Island, New York
2401 Eaton Lane, Racine, Wisconsin

CIRCLE INFORM-A-GRAM KEY NO. 28

MEN YOU SHOULD KNOW

The Onsrud Machine Works, Inc. has announced the appointment of **Theodore F. Eserkaln** as chief engineer.

Thomas B. Rhines has been promoted to assistant engineering manager and **Donald G. Richards** to chief engineer at Hamilton Standard, Division of United Aircraft Corp. Other changes include **Stanley G. Best**, chief of technical staff; **C. Deane McCarthy**, chief development engineer; and **Louis A. Urban**, senior project engineer.

The appointment of **Thomas W. Morrison** as director of engineering and research for SKF Industries, Inc. has been made known.

A. Lee Graham was recently promoted from plant superintendent to vice president in charge of operations at American Forge & Mfg. Co.

Taking over as manager of plant operations for Chicago Pneumatic Tool Co. is **Carra L. Lane.**

Micromatic Hone Corp. recently announced the appointment of **William J. Pinkerton** to executive vice president and assistant general manager.

Serving as chief engineer for the Cycleweld Chemical Products Division of Chrysler Corp. is **Edward J. Sydor.**

New director, vice president, and general manager of The Sheffield Corp. is **Thorpe Thompson,** former president of The Cleveland Instrument Co. **W. Fay Aller** was appointed to the board of directors and also serves as vice president of engineering.

Appointment of **Donald E. Lake** as production manager of the Milwaukee Division of Associated Spring Corp. was recently made known.

. . . **Continued on page 30**

Simple...Positive...Faster...Accurate Indexing with TRIG-R-DEX

Trig-R-Dex is a completely new concept in manual indexing that simplifies and speeds straight or spiral operations.

To index—simply grasp the Trig-R-Dex handle, push down on the trigger button and move the handle until index pin engages the next hole, pull handle to stop position and you have indexed one increment. During work processing operations, the Trig-R-Dex handle always remains stationary. But, the index plate is keyed to the driver holding the work center . . . this assures the index plate, center and workpiece turn as a unit.

By selecting proper index plate, both right- and left-hand operations having from one to ten spaces can be accurately indexed. Changing from one index plate to another is extremely easy and takes but a couple minutes.

Because Trig-R-Dex is simple in design, of rugged construction, easy to operate and precision made, it will give years of accurate, trouble-free service while reducing costs and boosting your production.

For further information, write to:

U.S. PATENT NO. 2,711,324

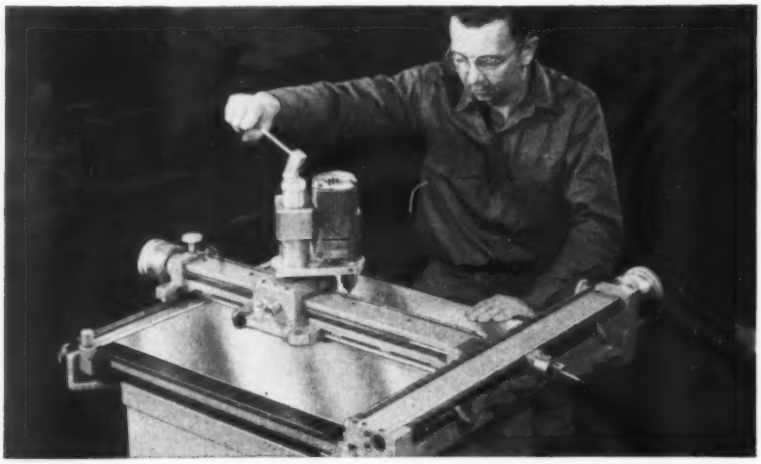
DETROIT REAMER & TOOL COMPANY

D R & T COMPANY

780 W. MAPLE ROAD • P.O. BOX 174 • BIRMINGHAM, MICH.

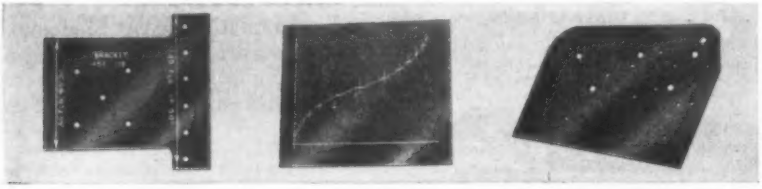
CIRCLE INFORM-A-GRAM KEY NO. 29

layout and template making time cut in half . . .



THE NEW STRIPPIT FLEX-O-DRILL

- **DRILLS, REAMS, SCRIBES, CENTER PUNCHES** to ± 0.002" WITHOUT base line drawing or height gauge layout!
- **EASY, ACCURATE POSITIONING**—quickly set to any reference point and to nearest 0.100" by adjustable steel tapes reading in both directions from zero. Micrometric gauges then bring settings to nearest 0.001". No optical scanning device needed.
- **LASTING ACCURACY!** Table is an actual ground surface plate. Bridge assembly is of heavy, accurately machined castings. Lead screws are precision ground and engaged only during micrometric gauge settings to minimize wear. All parts are corrosion-resistant. Bearings are protected against dust and chips by felt shields. Drill motor is heavy-duty industrial type.
- **¼" CAPACITY** in mild steel — stock up to 24" width, any length.
- **ALSO A PROVEN MONEY-SAVER** on pilot runs, low unit production.



Template drilled by Flex-O-Drill | *Layout scribed by Flex-O-Drill* | *Flex-O-Drill work piece*

WRITE FOR LITERATURE TODAY, and an actual demonstration at your plant:

WALES STRIPPIT INC.
212 Buell Road, Akron, New York
A UNIT OF HOUDAILLE INDUSTRIES, INC.

In Canada: Strippit Tool & Machine Company, Brampton, Ontario

CIRCLE INFORM-A-GRAM KEY NO. 30

. . . **Men from page 28**

New manufacturing manager of the Cincinnati Division of Bendix Aviation Corp. is **Edward A. Voss.**

Following the retirement of **Clark M. Adams** as general manager, **Robert F. Meyers** has been named operations manager, **Harold J. Padesky,** assistant operations manager, and **Orville Mickelberg,** manager, of the Bay City Engineering Laboratory. The Electric Auto-Lite Co. **Marvin Bendzick** and **Ted Kern** are new assistant engineering managers, and **August B. Meyer, Jr.,** administrative engineer.

Taking over as works manager for Wyman-Gordon's Worcester plant is **Loren K. Hutchinson.**

Newly appointed executive vice president and general manager for Syntron Co. is **Byron K. Hartman.**

Clearing Division of U. S. Industries, Inc. recently announced the appointment of **William Roorda** as director of production engineering.

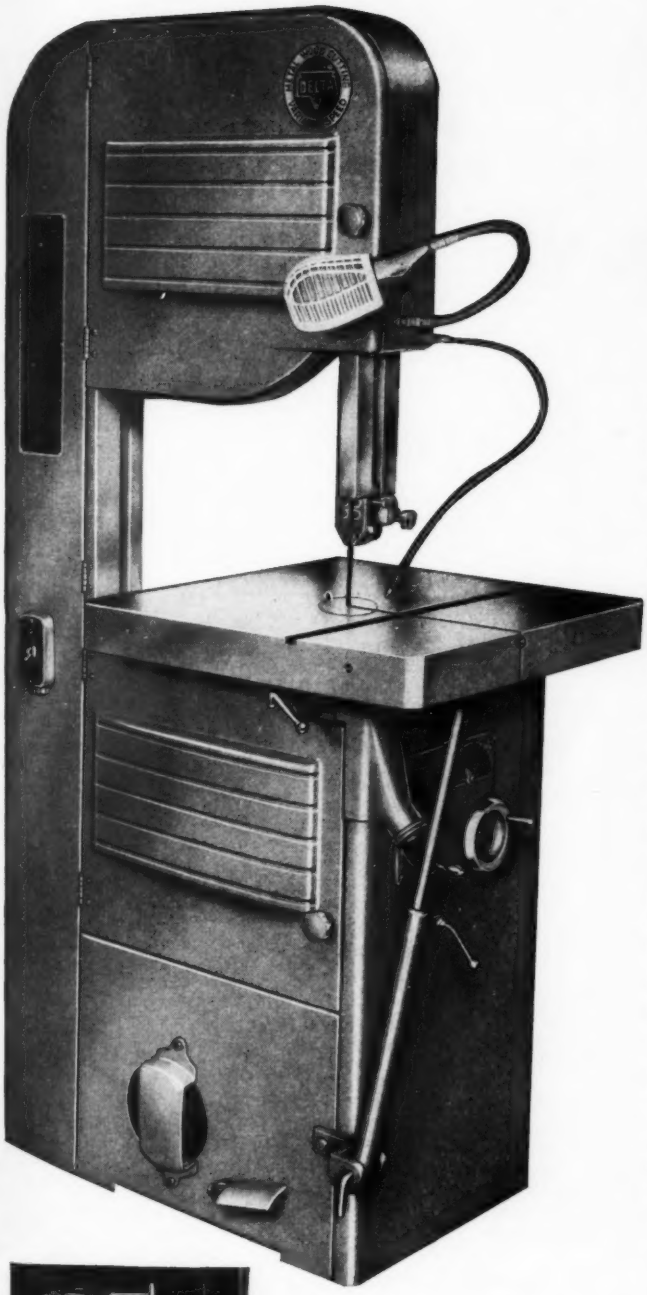
Newly appointed West Coast plant manager for American Machine Division, United States Chemical Milling Corp., is **Roy B. Williams.**

N. C. Hunt has come out of retirement to take over as president and chairman of the board of Hunt Valve Co., and **Lester A. Bateman** serves as executive vice president.

Russell, Burdsall & Ward Bolt and Nut Co. recently appointed **Lambert M. Kaspers** as Port Chester, N.Y., plant manager and assistant to the general manager; **George J. Nieman,** Rock Falls, N.Y., manager; and **Ronald M. Bowman,** assistant manager there.

The appointment of **Ralph W. Morrison,** vice president and director of The Aro Equipment Corp., to executive vice president of The Firewel Co., Inc., a wholly-owned subsidiary of Aro, has been announced.

NEW from DELTA



20" metal-wood *variable speed* BAND SAW

No matter what your cutting requirements —in the foundry, toolroom or pattern shop —this all-new Delta 20" Metal-Wood Band Saw gives you real on-the-job performance. Now—*for less than $900.00*—you can have the features you said you wanted most for greater accuracy and better cutting:

WIDE RANGE VARIABLE SPEED DRIVE . . . gives you a tremendous speed range—50 to 4500 FPM—for cutting everything from stainless steel to aluminum, wood and plastics. This versatility can't be equalled.

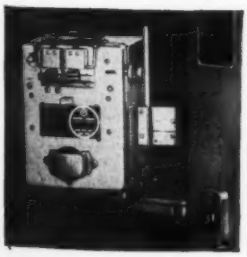
SCIENTIFICALLY DESIGNED BLADE GUIDES . . . ideal for heavy metal cutting because they furnish more "close up" blade support than conventional type guides. These new Delta blade guides are the key to better accuracy, straighter cuts, and longer blade life.

RUGGED FRAME CONSTRUCTION . . . features a massive, rigid internal frame with a modern fabricated exterior. Exclusive 3-point adjustability (wheels, upper guide and table) assures perfect alignment of key components.

In addition to these outstanding features you get a massive table with double trunnion support, convenient speed controls, plus built in chip blower *at no extra cost.*

SEE IT AT YOUR NEAREST DELTA DEALER— he's listed under "TOOLS" in the Yellow Pages—or write: Rockwell Manufacturing Company, Delta Power Tool Division, 622L N. Lexington Ave., Pittsburgh 8, Pa.

"Visit Delta in Booth No. 1042 at the National Metal Exposition"



BLADE WELDER, including shear and grinder, shown on No. 28-462. Bracket mounted on 20" Band Saw for machine-side use. (Optional accessories)

DELTA INDUSTRIAL TOOLS

another fine product by

ROCKWELL

CIRCLE INFORM-A-GRAM KEY NO. 31

NEW

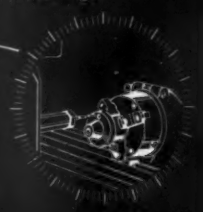
ERICKSON

MASTER SPACER

with No. 0 Timken Bearings

gives increased production and optimum accuracy in

straddle milling



milling

jig drilling
with either micrometer or "Jo" block setting

inspection

Write for free catalog "Erickson Master Spacer" today. And at the same time request your copy of Catalog K, you'll find cost-slashing applications for all Erickson holding tools.

The new Erickson Master Spacer quickly and accurately positions work for a wide variety of jobs. This *one* tool can eliminate expensive jigs and fixtures . . . makes it a simple procedure to set up drilling, milling, boring and special machining operations.

The new Erickson Master Spacer, ideal for tool room and production machining, assures outstanding performance under heavy helical cuts and slow feeds. *Indexing accuracy guaranteed within .001-inch cumulative error on a 6-inch diameter circle.* Jig drilling is possible with either micrometer or "Jo" block setting. Timken bearing construction permits work to be trued in position with brake off because spindle alignment remains unchanged.

The new Erickson Master Spacer can help you come to grips with your Number One Problem—high production costs. The first step is to get the Erickson story.

AA-3091

ERICKSON TOOL COMPANY

34451-11 Solon Road • Solon, Ohio

EXPANDING MANDRELS • EXPANDING-COLLETS • SPECIAL HOLDING FIXTURES
COLLET CHUCKS • FLOATING HOLDERS • TAP CHUCKS • TAP HOLDERS • AIR-OPERATED CHUCKS

CIRCLE INFORM-A-GRAM KEY NO. 32

Machine Tools via N-C . . . or . . .

The Builders Should Practice What They Preach

THE ECONOMIES that are consequent to the adaptation of numerical control are beginning to catch up with and overtake even the die hards.

The manufacturer (not you, of course) who has resorted to saying, "N-C? That's okay for the big plants but it's not for me," is being jostled to a rude awakening — by some of his competitors.

First of all, just what is a big plant? Is it number of employees? Number of machines? Number of acres or cubic feet? Number of jobs running? Number of customers? Is it mass production? Or profits?

Select any yardstick you will, and your applecart can be upset quite easily.

There aren't many metalworking facilities in this country as *big* as G.E.'s hydro- and steam-turbine generator manufacturing facility, several stories high because of the number of cubic feet (not square feet) necessary to accommodate the jumbo-sized machine tools which whittle chips from hundred-ton workpieces.

Big, yes. But not mass production. One turbine, one year — two year — delivery, whatever the case may be. But, albeit, a big and ostensibly profitable enterprise.

At the other (or small) end of the bigness scale is the screw machine products plant or department. Here is the epitome of mass production — zillions of pieces, all alike, and produced in many (and profitable) instances within a square foot area that would not accommodate even one elephant-sized machine tool.

The highly profitable screw machine shop may have but a half dozen operators and twenty machines, and (all in one) a combination proprietor, estimator, tool designer, advertising manager and head salesman.

In contrast, how many engineering manhours, mechanics and machine operators are devoted to producing only one hydro-electric generator?

Admittedly a wonderful mish-mash of thinking, terminology, futile comparisons, and interpretation. There just aren't any pat answers.

Is bigness synonymous with profits? A man could enjoy a luxurious retirement after his stint of proprietoring a screw machine shop; and G.E. could lose their shirts on one colossal turbine project.

To get back on our N-C beam after quite a detour, we do not think that it is over simplification to say that the be-all and end-all of any successful manufacturing enterprise, large or small, is simply to build and sell, ethically and conscientiously, the most and best that it can in its own competitive marketplace. That may be Utopian, but it works and proves out for many, many concerns.

In the attaining of these ends there's room for more and more N-C. Currently N-C is in the ascendancy of a rocket-like trajectory. It needs, like any phase of our economy, a booster stage.

Who is in a more strategic position to fire up the booster than the machine tool builder? We think he is the answer.

Traditionally, the machine tool builder — that breeder of such metalworking workhorses as lathes, milling machines, planers, grinders, boring mills, gear cutters, drilling machines, and automatics — is a rugged individualist, even unto today's 3rd and 4th generations. He, if anyone, is a job lot manufacturer, which is N-C's dish.

He likens himself to the aristocracy of metalworking. But he has had to divvy-up his market with some young upstarts — special machines and automation. So, understandably, he has cried to Uncle for tax relief and has gone alarmist over foreign competition.

Numerical control is shaping up as a golden opportunity for him to regain his place in the sun — he can be his own best salvationist.

Increasingly, machine tools are being offered with the manhour reducing feature of N-C. The purveyors of these machine tools say that N-C will cut your manufacturing costs. They say that you can boost your sales, increase your profits, realize your modernization goals, and cause your competition to take a new, fast look — at your progress.

The basic basic of all metalworking is that it takes machine tools to build machine tools. Therefore, who should be the leading exponent of N-C? Who, even selfishly, is the most logical beneficiary of N-C?

Our answer is: the machine tool builder himself. All he has to do is to practice what he preaches.

We say: that if a machine tool builder, in his own plant, will go to the ultimate 100% in N-C, will so modernize his productive effort that he can translate his demonstrable savings to you by a lowered asking price for his machine tool; if he can so cast himself as a $ and ¢ showcase for N-C, he is on his way to glory.

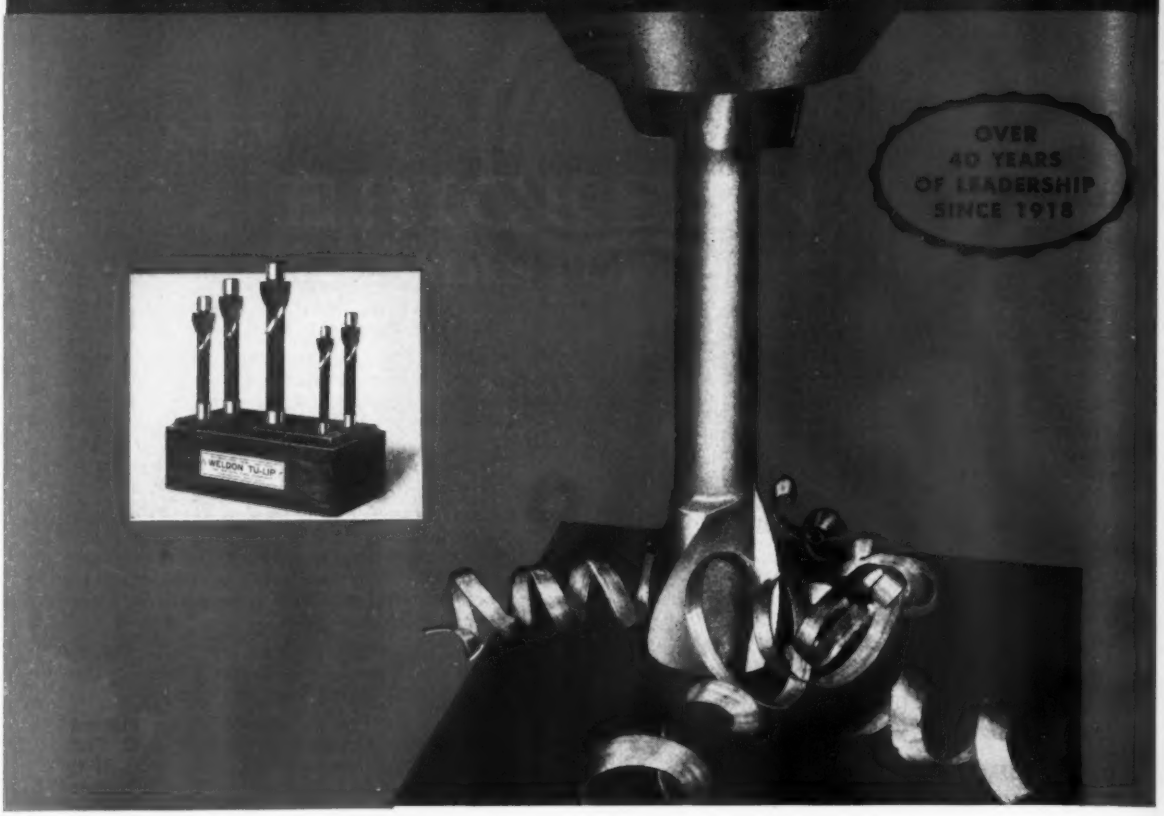
Thus would the machine tool builders' Golden Rule become, "You can do for others, what we have done for you." Or, even stronger, "You can do for yourselves, what we have done for ourselves."

So we say that the machine tool builder who wants to sell you his N-C equipped machines must remember that actions will speak louder than words!

E. Willard Pennington

Editor

YESTERDAY'S PIONEER . . . TODAY'S LEADER



WELDON "TU-LIP" COUNTERBORES FOR FAST, FREE CUTTING

As the name implies, WELDON "Tu-Lip" counterbores have only two cutting lips or flutes. This feature, together with the fast spiral, makes the "Tu-Lip" the fastest, freest cutting counterbore on the market.

Breakage due to clogging is prevented because this improved cutting tool provides more than ample chip room. Furnished singly in sizes desired or in convenient wood block sets as illustrated.

Catalog list numbers are now marked on all Weldon tools and holders as an aid when reordering . . . another WELDON FIRST.

Weldon distributors throughout U. S. A. and Canada carry complete stocks to serve you.

WRITE FOR FURTHER DETAILS TU6

THE WELDON TOOL COMPANY

3000 WOODHILL ROAD · · · CLEVELAND 4, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 34

Editor's note: When we first learned of Clarke Redfield's down-to-earth, shirt-sleeve approach to the academics of depreciation, amortization, and modernization, we asked him, "how come?" When he came back at us with "Common Sense and Machine Tools" and told us, further — "I graduated from N.Y.U. in 1930, and engineered commercial refrigeration and air conditioning installations until 1939. I then went to Wright Aeronautical in what we called Plant Planning. In 1951 I came to Bendix as Supervisor of Equipment Engineering. I think of myself as a Practical Engineer" — we then understood perfectly "how come." — *E.W.P.*

Common Sense and Machine Tools

a GUEST EDITORIAL
by Clarke Redfield
Supervisor, Machine Tool Procurement
Eclipse Pioneer Division
Bendix Aviation Corporation
Teterboro, New Jersey

MR. MANUFACTURER, if you are "average," your shop is obsolescent; you have not made those replacements over the years that you should have made. Today it only hurts a little. Your costs are a little high, but you can still pass most of them along to your customer. You were upset when your maintenance foreman asked for two more repair men this morning, but you agreed to give him one.

You were disappointed when your competitor got that nice contract you had been hoping for. But did you know that he got it because a Quality Control study showed that his product is made to closer tolerances, making for easier assembly and better maintenance? His spare parts can be depended on to fit when they are needed five years from now.

Mr. Manufacturer, do you know that that nice new machine you bought only three years ago, and were so proud of, is obsolete? For the last six months a machine has been available to do that same operation in half the time, and do it better.

Business is good, but competition is keen. The physical plant and facilities which produce your product constitute your business. If they become obsolete and inefficient, suddenly there is no business.

Your superintendent has been asking for new equipment, but you can't afford all the machines he wants. Of course not, not all at once. But you must start. This is a problem which can't be swept under the rug. It will not just grow either, it will snowball.

So face it in the only logical, sensible way possible. Allocate a definite amount to be spent in the coming year. This should not be less than 10% of the value of the equipment on hand. If it must be lower, at least set a definite figure and do it every year. The figure set may provide for only five projects, but knowing that only five projects out of possibly fifty or more which are needed will help as a guide in selecting the most important.

Next, make sure that the five projects selected are the best of the fifty. Sounds easy? No, this is the hardest part of all. Do not be lulled into complacency by magic formulas or machine tool builders' rosy production estimates. It just isn't that easy!

... **Continued on page 36**

... Continued from page 35

To prove the point, did you ever see a truly foolproof formula for investing in the stock market? And yet there are books of statistics, earnings figures, dividend rates, every conceivable fact and figure for every security, and all fully audited. It should be possible to throw all this data into a computer and select one best investment. Is this nonsense? Isn't it then even greater nonsense to try to select machine investments by formula, where factors and figures are inaccurate and incomplete? **All** the facts, **accurately** measured are next to impossible to obtain.

Now that you have decided on this common sense program, let's take a common sense approach to the problem of finding these first five projects.

Your shop superintendent knows where the fifty trouble spots are, but he is too busy to go into the details required to determine their relative importance. Also he probably has been too busy to keep up to date with the latest machine and tooling developments.

You have "specialists" in your legal department, in your accounting department, all through the organization. Do you have a "specialist" continuously studying your machine tools, your manufacturing methods?

Get an equipment engineer. Not a young hotshot right out of college and full of theories, but a man with machine experience, mature enough to recognize exaggerated claims, but flexible enough to accept new ideas. Don't load him down with paperwork, but let him roam the plant, observe, talk to operators, study inspection reports, look into machine repair records, keep abreast of machine and tooling developments. Have him talk to the engineers and designers about new designs, products, and changes. The design engineer usually is not production minded.

This then is your team, your equipment engineer and your shop superintendent. See that they meet regularly to discuss problems, findings and recommendations. Do not demand that every recommendation "pay off" in X number of months. Give them as free a hand as possible; let them feel and accept responsibility. Their future and job security is directly tied up with your future growth and prosperity. They will spend your money wisely.

Don't ask for long and detailed cost savings studies before the project is started. Ask for factual reports six months after the facility has been installed. Only facts and results are of any use to you. Forecasts, estimates, and hopes are for dreamers, and YOU can't afford to dream. end

REDUCE MARKING COST

WITH MODEL 465 HYDRAULIC MACHINE INSTALLED IN YOUR PRODUCTION LINE

Machine illustrated marks serial number, date code and part number identification on gear carriers at rate of 1200 per hour.

Parts are fed to machine from conveyor, marked and discharged to conveyor. ... Head indexes automatically for serial numbering.

Our engineering services are available to assist you in improving your marking methods.

Write or call EAstgate 7-0300.

If It's Worth Making, It's Worth Marking.

WRITE FOR COMPLETE INFORMATION

GEO. T. SCHMIDT, INC.
4112 Ravenswood Avenue
Chicago 13, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 36

Europe 'Roughs Up' Ceramics

by Jean-Louis Guedeu
as told to
Carol E. Reuss

WHO SAID CERAMIC CUTTING TOOLS should be saved for finishing operations? That they should be protected from impacts of interrupted cuts? Experience in a number of European plants points to wider, and even rougher use of ceramic or oxide tools. They're using them to take interrupted cuts, to peel tough scale from castings, and for milling—and they're doing it economically.

Sintered oxide ceramics are pure or nearly pure oxides of aluminum (or manganese or titanium) compressed into compact crystalline masses of a density approaching that of the pure crystal. They differ from "dinnerware" ceramics in that they do not have the vitreous phase, which adversely affects the qualities needed for cutting tools.

Their properties include a high melting point and considerable hardness and strength at high temperatures. They're inert to most metals and resist built-up edge.

The fact that the tool's cutting edge gets very hot when run at high speed is not a detriment, but serves to heat the work locally and reduce surface cohesion. The machinability of steel or cast iron is thus increased, and cutting operations facilitated. They also have a place in the lower speed range for operations too rough and tough for other tool materials. This will be explained further with examples of how low speeds and feeds teamed with ceramic cutting tools to machine cast iron and steel workpieces that were "killers" so far as tool life was concerned. Ceramic tools have, in fact, lasted twice as long as carbides when run in the carbide-tool-speed range.

In each of the operations reported below, Ceroc ceramic inserts, developed in France and now available in the U. S., were used. Criterion for the turning reports was at least two months' use in mass production applications. The milling examples are from tests conducted with France's Ernault Batignolles Co.

Mr. Guedeu is head of the Ceramic Cutting Tool Department at Compagnie Generale D'Electro Ceramique, Paris, France.

Cast Iron Turning

Experience in many European plants shows that ceramics are durable enough to turn cast iron. They can "take" the impacts and interrupted cuts, and at the same time speed up the operations and give improved finishes with fewer regrinds.

In one automotive plant, Ni-Cr cast iron liners are turned faster with ceramics on a 20-hp automatic Pilot lathe, resulting in better surface finish. The operations (Fig. 1) are finishing the OD, grooving, collaring, and facing the bottom surface of the 4.3" to 7.8" dia parts.

Oxide cutting speed is 656-820 sfpm, depending on the workpiece size. With carbides, the speed was 262.4 sfpm. Production with oxide tooling is 80-100 pc/cutting edge, the same as with carbides, but surface finish is improved to 28-60 microinches.

In another automotive plant an 8-hp automatic Sundstrand lathe, tooled with ceramics, rough turns cast valve seats. The skin is hard and has a warped cutting surface. With ceramic tools, speed is raised to 656 sfpm (from 147.5 sfpm with carbides), and parts are finished in 47 sec rather than the 1.54 min taken with carbides. Experience has been no scaling off in spite of the impacts caused by the cast surface condition.

Another plant reports these comparative figures for a truck brake drum turning operation on an 8-hp Sundstrand lathe: With carbides speed was 328 sfpm; with ceramics it's 1181 sfpm. With ceramics, feed re-

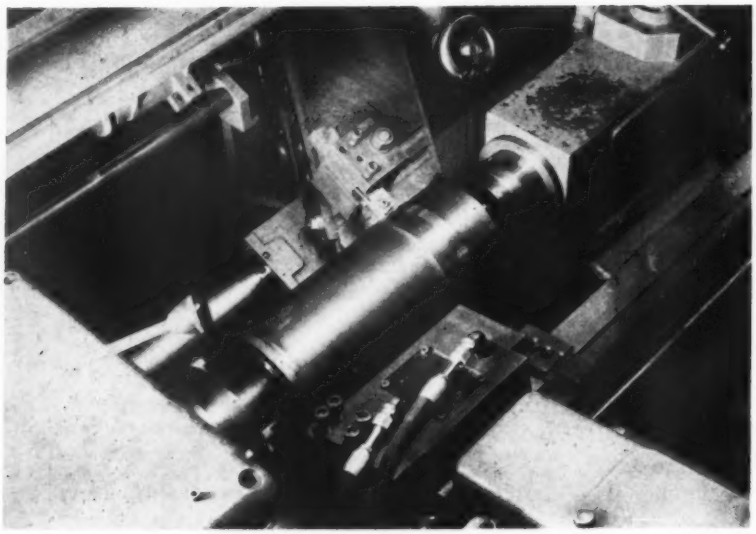


Fig. 1. Cast iron liners machined with triangular ceramic inserts on an automatic Pilot lathe.

mains at 0.0039, or 0.0078 ipr, depending on finish requirements; and depth of cut is variable from 0.039-0.059", the same as for carbides. With ceramics, production increased from 5 to 10-12 pieces/cutting edge.

At Ernault Batignolles, chip disposal became a problem when working with ceramics. Hot chips accumulating on the sliding parts of the bed could deform them, so the company quickly made sure the chips were removed.

One plant is using ceramic tools for roughing the OD and faces of driving pulleys, and using ceramic form tools for plunge cutting the grooves.

An 18-hp Sculfort horizontal lathe tooled with ceramics is used in another plant to machine large cast iron pistons. There are two impacts per revolution. With the oxide tools, speed is 541 sfpm; feed for turning, 0.031 ipr, for facing, 0.019 ipr; and depth of cut for turning, 0.078-0.097", for facing, 0.078-0.117". They are machining 30 pieces/cutting edge and have witnessed no scaling off in spite of the two impacts per revolution. Floor-to-floor time for the 30 pieces is 15 hr.

Another plant uses a Cazeneuve lathe (15-hp) with copying attachment for machining 17.7" of 8.6" dia blistered castings. The operation consists of turning the drum-shaped parts in a convex form. A straight turning tool is used, clamped in reverse position in the rear turret. Speed is 426.5 sfpm; feed, 0.0118 ipr; depth of cut, 0.118-0.175"; and time, 1.45 hr/cutting edge. These speeds are not normal "ceramic range" but the company is happy with the operation because machining time for the hard-to-machine castings was cut 50% compared with former conditions.

Steel Turning

The variety of steel turning operations reported from Europe show added versatility of the ceramic cutting tools. They're used with a 25-hp Sculfort horizontal lathe for machining semi-hard steel shafts for a paper mill equipment manufacturer, for example, with the resulting finish so good that a grinding operation has been eliminated. Roughing cut speed is 810 sfpm; feed, 0.024 ipr; and depth of cut, 0.136". For finishing, the speed is 960 sfpm; feed, 0.0118 ipr; and depth of cut 0.008".

Total machining time is 6½ hr, including lost time and time for machining keyholes and tapping the ends. The same machining without ceramics took about 15 hr. This firm also reports that the geometrical form of the shafts machined with ceramics is more accurate.

The following three examples are from French Railways Co. shops. In the first, an 18-hp Sculfort lathe finishes wheel seats on 7.6" dia axles. With ceramics eight axles are machined per day, instead of the five previously handled. Speed is 1148 sfpm; feed, 0.0043 ipr; and depth of cut, 0.019".

To finish truck axle shafts with ceramics, a 1437-1167 sfpm speed (depending on the size of the shafts), 0.0078 ipr feed, and 0.019-0.039" depth of cut are maintained. Production is three to four machined axles per tool, depending on the origin of the workpieces.

The third railway application involves taking roughing cuts on mild steel bearings with a ceramic-equipped Lodge lathe. The operation is exceptionally difficult because the mild steel contains hard grains. The speed with oxides is 958 sfpm; feed, 0.0097 ipr; and depth of cut, 0.039".

In another European plant, ceramics are used on a 20-hp vertical lathe for three operations on heavy electrical equipment. The non-magnetic steel is especially difficult to machine, so the speeds with the oxides are exceptionally low. Prior to oxides, however, speed was only 30.3 sfpm feed, 0.0093 ipr; and depth of cut, 0.0078". The user also reports that it is easier to obtain the required fit dimension by using oxide tools.

The first operation involves turning, facing the two surfaces up to the required length, and boring. The second is machining the alternator rotor hoods. The third, machining the OD of the hood fitting into the rotor on a horizontal lathe. Cutting conditions for the three operations

the first two on a vertical lathe, are as follows:

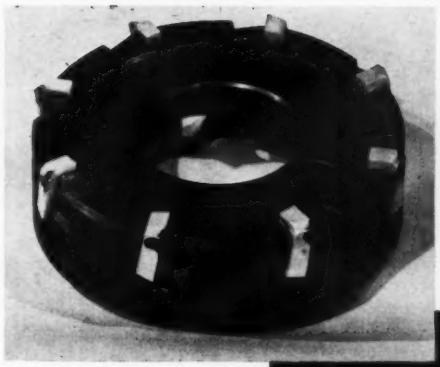
Operation 1 — Facing: speed, 374 sfpm; feed, 0.0093 ipr; depth of cut, 0.078″; length to be machined, 1.75″. Boring: speed, 374 sfpm; feed, 0.0093 ipr; depth of cut, 0.039-0.0019″; length to be machined, 1.75″.

Operation 2 — Semi-finishing and finishing: speed, 308.3 sfpm; feed, 0.0093 ipr; depth of cut, 0.0097″.

Operation 3 — Machine OD: speed, 308.3 sfpm; feed, 0.0097 ipr; depth of cut, 0.0078″; time, 51 min. Slope: speed, 308.3 sfpm; feed, 0.0097 ipr; depth of cut, 0.0078″; time, 20 min. The user adds that the cutting speeds were slower on this latter operation than those obtained with a vertical lathe because of the size and weight of the rotor, heating-up of the steady-rest, and vibrations to be avoided. Finishing has been performed in one cut on each hood with ceramics, which was not possible before.

The Sculfort firm has performed two other machining operations successfully with oxide tools. The first workpiece is a chrome-moly steel pinion that is recut and faced at a 984.2 sfpm speed, 0.0018 ipr feed, and 0.118″ depth of cut. There, too, the different diameters of steel lathe spindles are roughed with a straight turning tool at a 721.7 sfpm speed, 0.015 ipr feed, and 0.234″ depth of cut. The finishing operation is performed with a triangular-tipped high cut tool with a feed of 0.0078 ipr, depth of cut of 0.059″, at these speeds: 1148 sfpm on the ID of the treated collar, and 656 sfpm on the diameters receiving the pinions and bearings.

At the Somua factory, a 14.94″ dia, 70.8″ long steel printing cylinder is finished at 885.8 sfpm. Again, size and weight of the workpiece does not enable use of a higher speed. Feed is 0.0058 ipr and depth of cut is 0.019-0.039″. Front wear on the tool is only 0.0078″ after the 70.8″ cut.



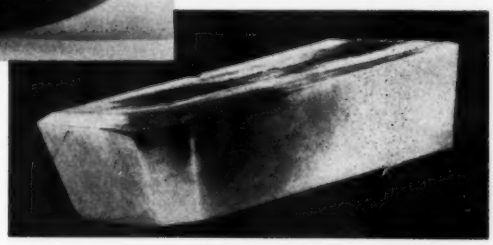


Fig. 2. Condition of ceramic milling cutter and an insert after milling away almost 200 lbs of chips from rough-cast lathe beds.

In turning steel at high speeds it is necessary to use chip-breakers. The chip breaks with difficulty with some steels and the chipbreaker must be adjusted with great care. In the case of very deep shoulders, a divergent chipbreaker promotes the chip removal; otherwise there is a danger that the back portion of the cutting edge will scale off.

Milling

Many engineers and metallurgists have proposed that ceramics could be used for milling, but few have had any experience along this line. Production-like tests conducted in cooperation with France's Ernault Batignolles Co. show they can and do withstand milling impacts.

In one test a 6.29″ dia milling head with eight mechanically clamped cutters was used on a 54-hp milling machine. The tips were sharpened with −5° negative radial and negative axial angles. After insertion they were rounded off carefully in the axial and radial directions with a lubricated diamond wheel. Two milling operations came next:

The first involved finishing Meehanite cast iron lathe bed feet. Speed with ceramics was 948.2 sfpm; table feed, 9.44 ipm; tooth/feed, 0.0019 ipr; and depth of cut, 0.039″. Total machined length was 85.3′, representing 11 beds and two cuts per bed. Cutting time was 2 hr, and tool wear was only 0.0118″.

The resulting surface condition was considered very good from the first to the last cut and dimensions and flatness were wholly maintained. Bed edges did not splinter as the cutter left the cut, and there was no chatter.

In the second test, two operations were run through to remove the skin from rough cast beds. The first was done with an end mill and 0.195-0.235″ depth of cut. The second operation with an end and side working cutter (double slope cutter) and 0.39″ depth of cut. Speed was 984.2 sfpm; table feed, 17.2-22.8 ipm. Table feed for the last three beds, however, was upped to 31.4 ipm. Total machined length was 26.2′; actual cutting time, 1 hr. Front wear on the tool was 0.0078″ (Fig. 2).

In these tests, 176.3-198.5 lb of chips were removed per hour. Persons connected with the tests believe that 661-881 lb can be removed from cast iron with ceramic tools if sufficiently powerful machines are developed.

Extra copies of this article are available while supply lasts. Write Tooling & Production Magazine, 1975 Lee Rd., Cleveland 18.

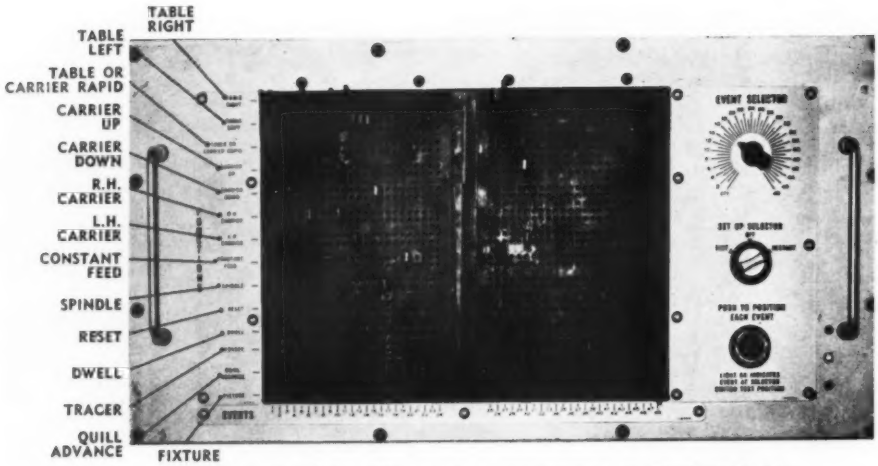


Fig. 1. Complete milling cycle is programmed on Cincinnati's Telematic control panel by inserting pegs opposite machine functions in proper sequence. This is a special panel, with 48 event possibilities.

Peg Board Controls Milling Cycles

AN AUTOMATIC TRAFFIC COP is the best way to describe the new automatic milling machine cycle control developed by Cincinnati Milling Machine Company. The Telematic control uses a peg board-type panel and plugs to direct the sequence of fixture clamping and indexing, and machine functions and movements. It's especially for Cincinnati's 200 Series Hypowermatic miller.

For each machine function the panel has a row of holes allowing the operator to "peg-in" complex automatic milling cycles involving up to 24 steps or events. Plugs (Fig. 2) are inserted in holes opposite the desired function in proper sequence (Fig. 1).

A stepping switch scans the control board one step at a time and initiates all functions indicated by the placement of pegs. This is done through trip dogs, positioned on the machine table and spindle carrier. When the stepping switch scans the "reset" plug it automatically returns to its initial point ready to start a new cycle.

The machine functions that

Fig. 2. Insertion of this simple plug in Telematic panel programs each event in milling cycle.

can be programmed include table right or left, table or carrier rapid, spindle carrier up or down, constant feed for accurate stop, dwell, quill advance, tracer control, spindle rotation, fixture control, and reset.

To simplify setup, a switch positions the machine elements to any selected point in the cycle and a pushbutton initiates the next action without waiting for the trip dog to function. If, during the operation, the operator wishes to determine where the machine is in its cycle, he need only turn the selector switch; the panel light will come on when he has reached the active event. The operator may also stop the machine at any point in the cycle and resume the cycle without returning to the original starting point.

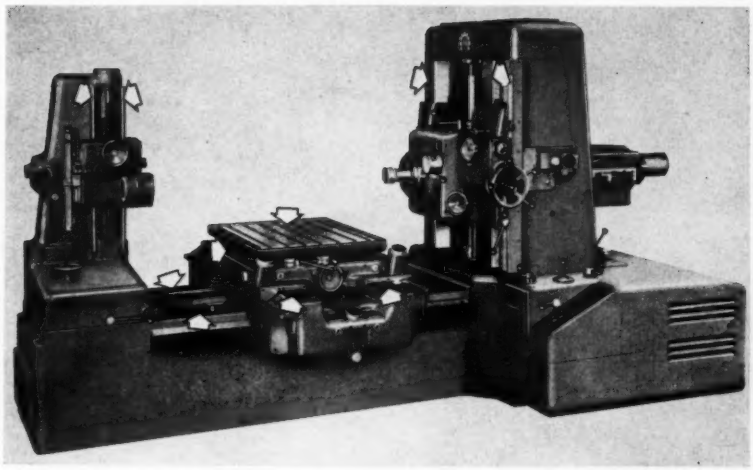
Tracer control can be programmed as simply as any other machine function. Accurate stop within 0.001" can be pegged in as an automatic function. Then too, several depths of cut can be made in a single cycle even if trip dogs must be by-passed to reach the required depth. No trip dog is activated unless its function is pegged-in the control board for that particular event in the cycle.

When it is necessary to follow one event very closely with a second, the trip dog for the second event is set in a different T-slot and will actuate its event even though the first event trip dog is still partially depressing its plunger.

To simplify machine programming, templates with holes punched to program a specific job can be superimposed over the Telematic panel. Cincinnati provides either punched or unpunched templates. Templates punched to program specific jobs can be removed and stored to facilitate setup for re-runs. end

Extra copies of this article are available while supply lasts. Write Tooling & Production Magazine, 1975 Lee Rd., Cleveland 18.

Checking Machine Ways . . . after scraping



by R. Bellmann

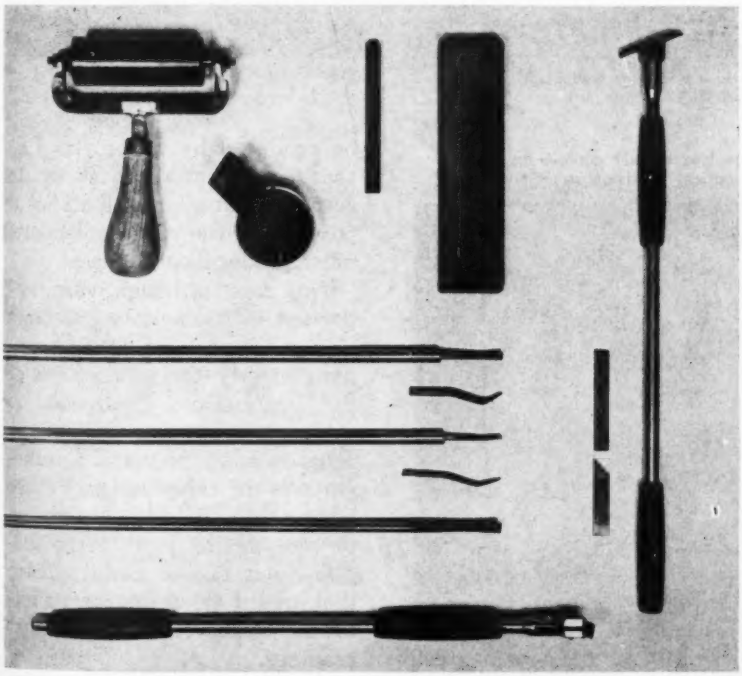
MANUFACTURING HORIZONTAL JIG BORERS IS DIFFICULT; it's probably one of the most difficult jobs in the making of precision machine tools. In spite of the many interrelated elements and superimposed slides, necessary so that they may do what they do, they must offer the highest precision.

In order to understand the manufacturing problems, an analysis of makeup is necessary.

A longitudinal underslide is guided on the machine bed and carries a transverse upperslide, which in turn carries the rotary table. The bed also has vertical columns mounted on it on which the headstock slides. The headstock carries the hollow-spindle, in which the proper boring spindle slides with its internal taper to accept the tool — normally a boring bar.

Parallelism of 0.0002" tir for a tool or a test bar (mounted in the spindle) with the surface accepting the workpiece gives an idea of the accuracy to which

Fig. 1. Scraping tools. For roughing a ½" blade is used. Next, a "semi-finish" blade is then used and then a "finishing" blade (⅛" wide). A leather strip and a foam rubber roller serve to apply a thin even layer of blueing compound.



Mr. Bellmann is Chief Engineer with Dixi S.A. Usine II, Le Locle, Suisse.

Fig. 2. Scraping by pulling during semi-finishing.

each element must be machined, scraped, or adjusted. This figure has to be maintained at any position of the slides, the table, the headstock, or the spindle.

It is not sufficient to produce machine elements to "as close as possible" accuracy with standard machining processes and then scrape the surface of the assembled table parallel to the test bar mentioned above.

For any one position of the table, the slides, and the head stock, excellent results can be obtained by scraping parallelism relationships even closer than 0.0002". Theoretically, any single combination of positions of the different moving elements could

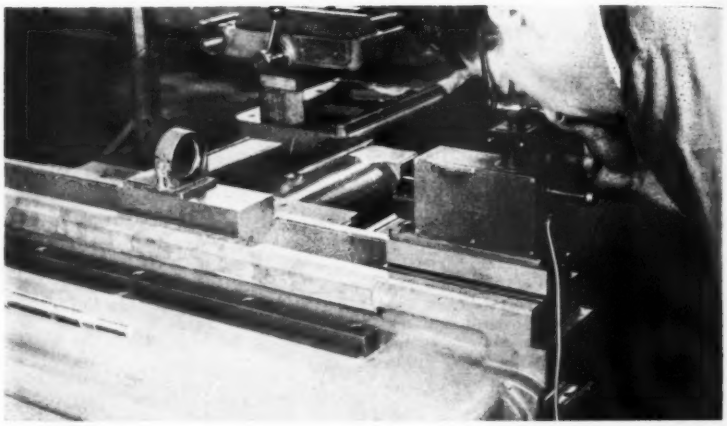
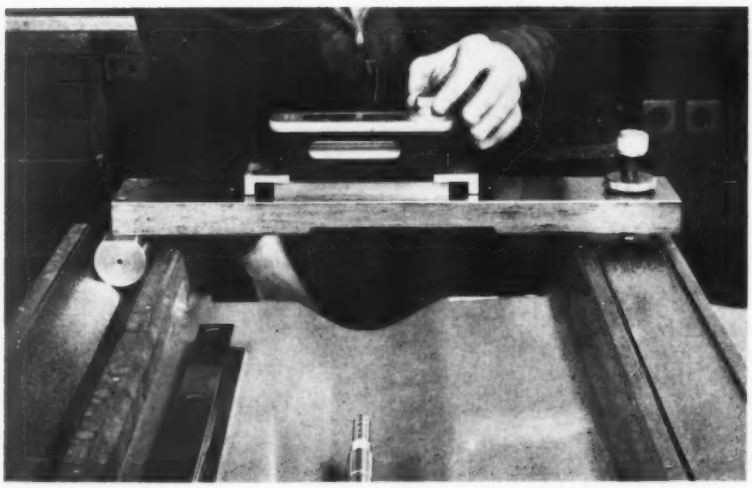


Fig. 3. Measuring a guide-way with a precision auto-collimator. After each measurement the mirror is moved 10". If the surface is not flat, the mirror will reflect the out-of-plane condition. Deviation from parallelism can be measured directly.

Fig. 4. Measuring the parallelism of two longitudinal guide-ways of the machine bed with a bridge and an optical precision spirit level.



be produced by this method so that the sum of all errors would zero out. But all combinations of positions of the various elements must produce parallelism.

This fact, although very important in itself, is only a fraction of the problem. Other problems are 1) the squareness of the longitudinal guide-way to the transverse guide-way, 2) the squareness of the vertical guideways of the columns to all those horizontal and to the centerline of the spindle, and 3) the displacement of the table surface that might be found by longitudinal, transverse, or rotational readings.

Fig. 5. Measuring the squareness between the vee-guide-way of the bed and the under slide. A triangular indicator carrier (reading to 0.00004"/division) is swung nearly 180° in the vee of the bed. Its axial position is maintained by pressing it against the steel ball which contacts a hardened and ground steel plate. At both extremes of its swing a cylinder, lying in the vee to be checked, is contacted. If both readings are alike, the two vees are perpendicular.

On machines equipped with a tail stock other considerations are added, such as the centerline of its supporting bearing being "in-line" with the spindle bore over its whole vertical displacement.

Another typical difficulty is in that most of the guide-ways must be scraped without any load on them. But after assembly, they will be burdened with considerable weight, causing some deflection in spite of any design considerations.

The answer to these rather difficult questions is a "corrected" form of the guide-ways. This means that each guide-way which is likely to have a deflection after assembly must be scraped in a way to compensate for this so that the end result after loading will be correct.

It is obvious that mechanical machining will not do the job; a

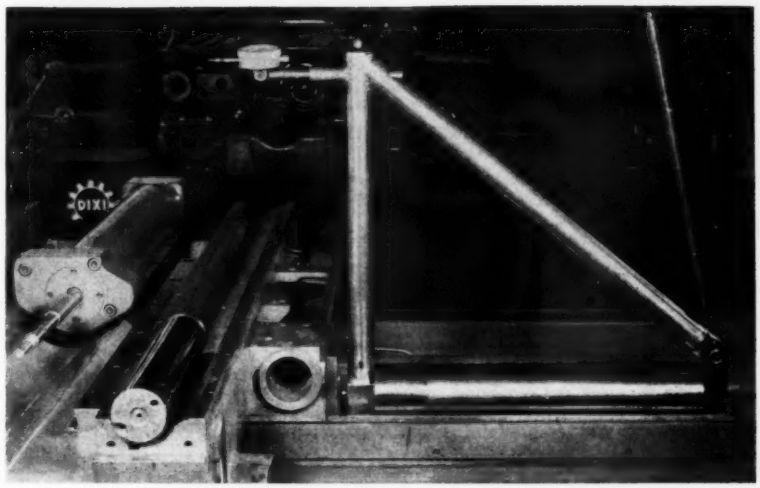


Fig. 6. Note the special handle used, as touching the tubing arms would deflect them. This scraping job is the most difficult of all on the Dixi. Three conditions for the upper vee must be fulfilled — it must be slightly hollow, it cannot be twisted, and it must be square with the lower vee. If one of these three receives correction both of the other two will be influenced.

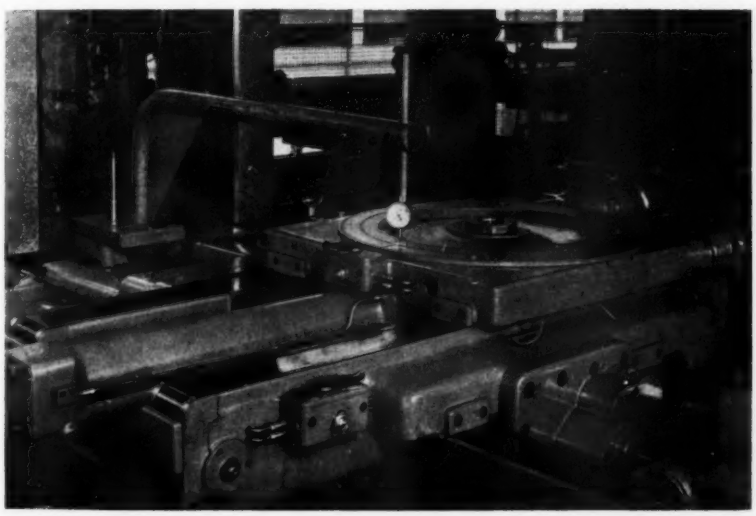


Fig. 7. The upper sledge is mounted. The surface carrying the rotary table must be scraped in a parallel plane to the longitudinal and transverse guide-ways. A dial indicator is attached to a fixed point and four points are indicated, two through a transverse motion and two using a longitudinal motion. All four must show the same reading. It is necessary to use a rigid indicator and a slip gage between the surface and the measuring point of the indicator. The gage is to bridge the little waves of the scraped surface.

Fig. 8. The bushing for the pivot of the rotary table must be "dead" perpendicular to the scraped surface. This is checked by swinging a dial indicator 360° over its surface. The pivot of the arm turns without play in a lapped steel bushing and rests on a steel ball at the bottom.

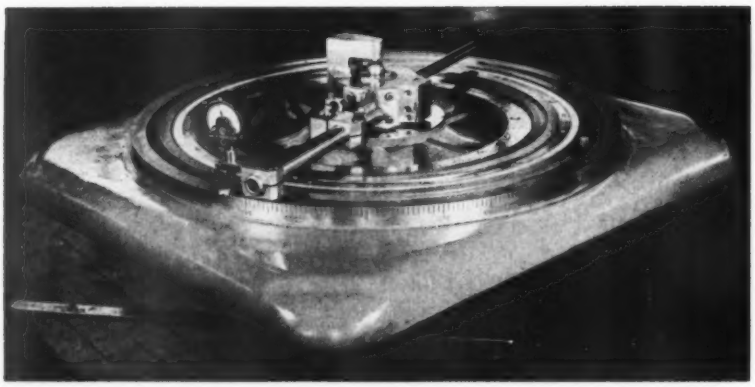


Fig. 9. Here the rotary table is upside down to check the squareness of its pivot and mounting surface. Note the large white ring in the table. This is the chromium plated, polished, diamond engraved precision scale for optically setting the table in use.

Fig. 10. Scraping the surface of the rotary table by means of a "surface box" especially developed for this purpose. Standard surface plates are not rigid enough for the accuracy required. So this heavy ribbed box does the job. Coil springs are mounted in the vertical tubings to compensate for weight.

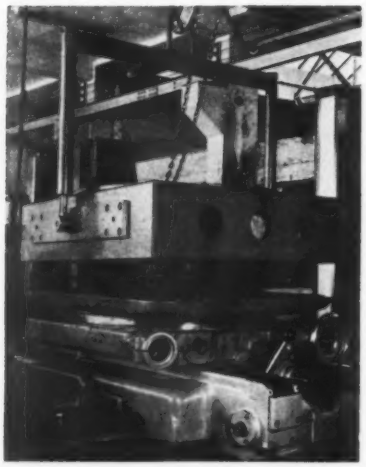
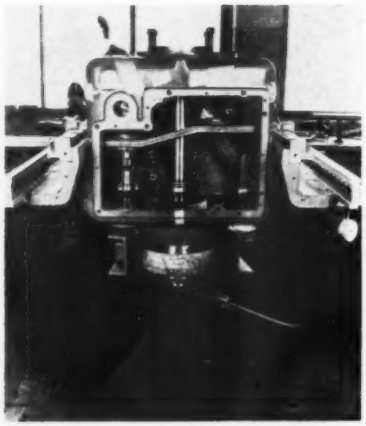


Fig. 11. Scraping the head stock guide-ways perpendicular to the spindle; shown is a position 90° to their normal use. The hollow spindle is already mounted in its bearings. A heavy arm holding the indicator is attached for indicating and straight-edges protrude on each side of the guide-ways for indicating their surfaces. All points must show the same reading.



machine can't produce the complicated forms necessary and the accuracy obtained would be limited by the accuracy of the machine doing the work. In most cases, fine hand scraping is necessary and, provided all the possibilities of scraping are exploited, the degree of precision is limited only by our ability to measure.

Proper conditions are necessary for fine measurement and the best measuring methods and the most rigid measuring tools are a must. Gages, or tools, must produce **exactly** the same reading every time a measurement is repeated.

Correct blueing must be practiced by applying a very thin even layer. Mating the male and female slide, or the gage and the is a must for best results. Otherslide, under a very low pressure wise the two elements would be pulled together by adhesion and always show a "perfect result."

Proper scraping is done by pulling **only** (scraping by pushing always results in digging in) and produces many fine points of contact. In the case of Dixi scraping, 30 to 40 points per square inch are used.

It would take a whole book to explain — even roughly — all the operations, beginning with the guide-ways of the bed and ending with the top ends of the columns. The illustration of tools and of some interesting checking operations will "be worth 10,000 words!" end

Extra copies of this article are available while supply lasts. Write Tooling & Production Magazine, 1975 Lee Rd., Cleveland 18.

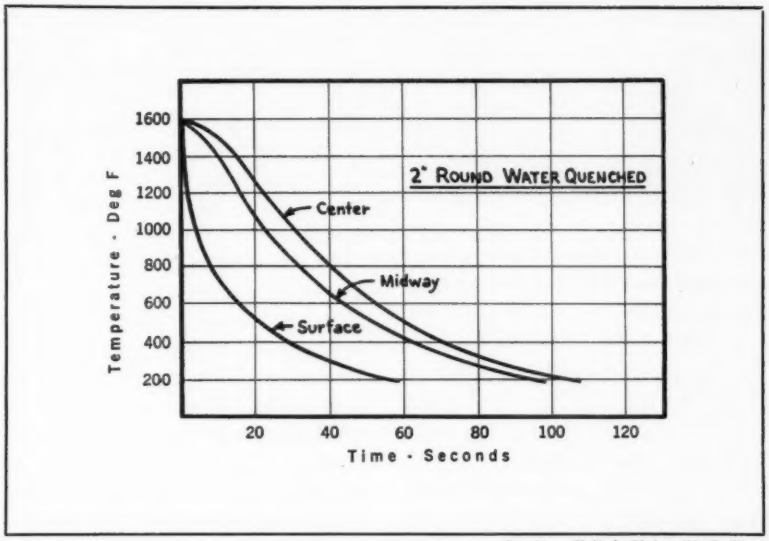
HEAT TREATING TODAY — Last of a Series

Quenching for Quality

by Lester F. Spencer
and
Charles Weiner

HUNDREDS OF YEARS BEFORE METALLURGISTS understood the theory of quenching, practical heat treaters were aware that controlled cooling of heated steel could produce desirable properties in the finished product. Now that researchers have entered the scene more is known about rates of cooling and it is possible to maintain closer control of end properties.

When heated steel is slowly cooled it undergoes internal structural changes at certain temperatures. Quenching removes heat rapidly enough to prevent these changes from taking place at relatively high temperatures; they are delayed until a lower temperature is reached. Postponement of the upper-temperature transformations results in the formation of martensite, a very hard structure.



Courtesy United States Steel Corp.

Fig. 1. Cooling time for several positions of steel bar. Surface cools faster than inside of bar.

Critical Cooling Rates

Each grade of steel has a critical cooling rate given by its time - temperature - transformation curve (see "Metallurgy of Heat Treating," T&P, July '59, p. 48). If heat is removed from the steel at the critical rate or greater, the hard martensite structure will be formed. Subsequent tempering increases ductility and reduces hardness and strength.

Critical cooling rates vary with the carbon content of the steel. As carbon increases from 0.20% to 0.80% the necessary cooling rate is lowered; an increase from 0.80% carbon demands a slightly increased rate. Most of the alloying elements used in steels tend to slow down upper-temperature transformations and therefore permit formation of martensite at slower cooling speeds.

It is very important to know the hardenability, or capacity for hardening, of the particular grade of steel before devising the quenching treatment. Hardenability is based on the depth to which a piece hardens under standardized cooling conditions and depends on the carbon and alloy content of the steel, the temperature of the piece prior to quenching, and the time held at that temperature. This information may be determined from data supplied by steel makers and by simple tests on sample workpieces.

Mr. Spencer is a metallurgist with the Allis-Chalmers Mfg. Co. of Milwaukee, Wisconsin. Mr. Weiner is assistant editor.

Quenching Stresses

Extremely fast cooling results in internal stresses which may cause cracking and distortion. These stresses result from the temperature difference between the surface of the piece, which cools first, and its center, which cools more slowly (Fig. 1). Contraction and expansion take place at different rates throughout the part and, in certain sizes and shapes, this effect is severe enough to generate high stresses.

In the design of parts to be quenched, care must be taken to avoid sharp angles and corners, and abrupt changes in section thickness. Gradual tapers, and insertion of radii and fillets at reentrant angles should be included in the design to minimize temperature differences which result in stress concentrations.

It is often necessary to specify steels with carbon and alloy content high enough to slow down the necessary cooling rate so that temperature is more uniform throughout the piece. This permits larger pieces to be quenched without producing damaging stresses.

Selecting the Medium

Choice of the proper steel and the appropriate design is no guarantee that the quenched part will have the desired properties. The quenching technique and medium used are also of fundamental importance.

The function of a cooling medium is to extract heat from the surface of the steel. When this occurs, the surface of the piece is at a lower temperature than the center and therefore heat flows outward to the surface where it is transferred to the bath. Although the rate at which heat is extracted varies with the cooling medium, all liquid quenchants operate on the same principles.

There are three stages in a quenching operation. In the first stage, which begins as soon as the hot steel is immersed in the liquid, a vapor "blanket" surrounds the part. This vapor film, caused by vaporization of the liquid by the hot metal, slows down heat transfer from the metal to the main body of liquid.

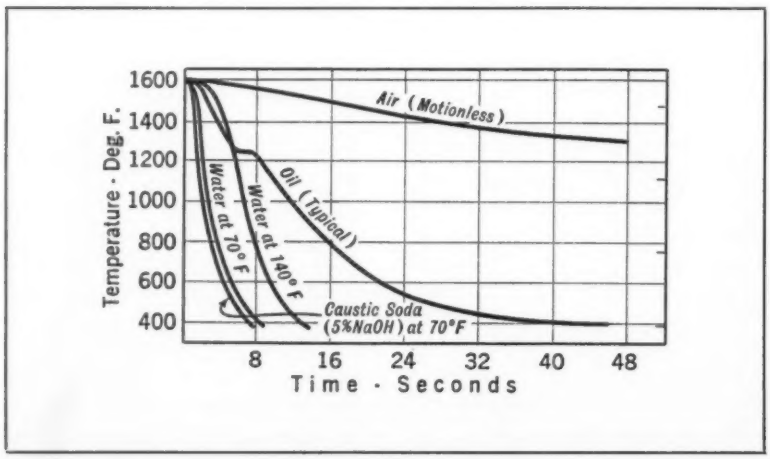
The second stage begins when the temperature of the part falls and the vapor "blanket" collapses, permitting the quenching liquid to come in contact with the surface of the piece. The liquid wetting the metal surface boils and heat is extracted more rapidly due to this vaporization. Heat is carried away by the vapor and more liquid comes in contact with the hot surface. During this turbulent stage the temperature of the steel drops rapidly.

When the surface temperature of the steel falls below the boiling point of the liquid, the third stage begins. Transfer of heat then proceeds through the liquid film on the steel's surface by conduction and convection. Cooling is slower in this final stage than in the second stage.

Since the first or vapor blanket stage inhibits heat transfer, it is desirable for this phase to be short in duration, so that the liquid can come in contact with the part surface. During the second stage, incomplete contact may occur as a result of localized vapor masses formed at the surface of the piece. Unless the vapor patches are dispersed these areas cool more slowly, possibly resulting in soft spots.

Fig. 2. Comparisons of cooling of ½" dia x 2" steel cylinders in different coolants.

Courtesy International Nickel Co., Inc.



Water as a Quenchant

Each quenching medium has a different heat-extracting ability and steels are classed as water-hardening, oil-hardening, or air-hardening, depending on the cooling rate needed for full hardening.

Water has the fastest cooling effect and is cheap and readily available. Its use is limited, however, because vapor formation is high and the first stage of the quench is prolonged. In the important final stage, where the desired martensite is formed, water provides a relatively high cooling rate. This increases the danger of cracking and excessive distortion.

Heating the water to prolong the final stage would result in persistence of the undesirable vapor formations of the early stages. Agitation of the work and use of sprays help to dislodge the vapor masses; this results in faster cooling in the early stages and in more uniform hardening.

The bath is usually maintained at a temperature of 70°F. Addition of 8 to 9% of rock salt (NaCl) or 3 to 5% of caustic soda

(NaOH) to the bath tends to remove the vapor film and increases the effectiveness of a water quench. An excessive amount of these additions, however, slows down the cooling rate in the second stage.

Steels designated as water hardening, shallow hardening, and carbon steels in general, require a rapid cooling rate for full hardening and are water quenched. Small section sizes are preferred to avoid uneven hardening and excessive strains.

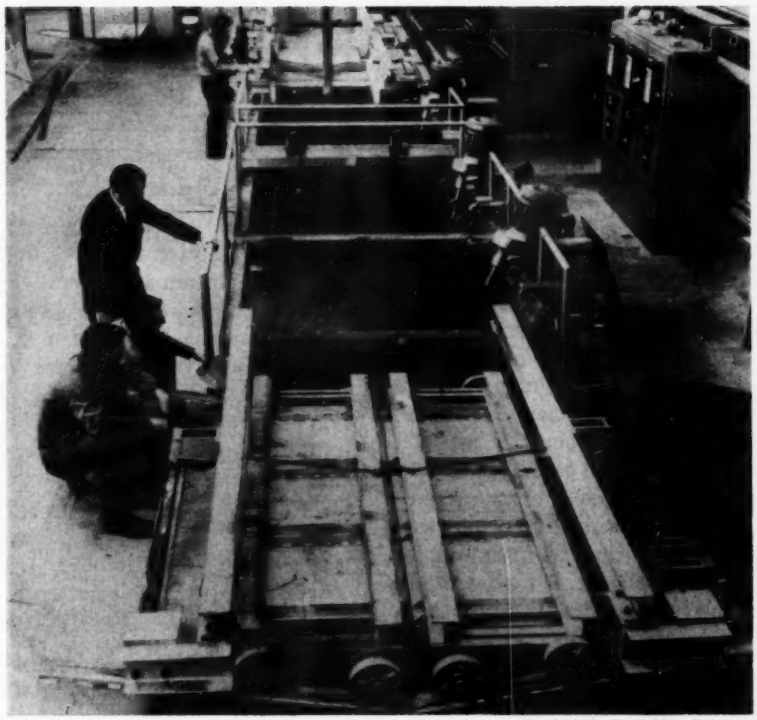
Oil as a Quenchant

Oil is a less severe quench than water and is preferred for most applications. The vapor envelope formed in the first step of an oil quench is less of a heat insulator than the steam envelope formed by water. This reduces the danger of soft spots in the finished work. Second and third stage cooling is slower than the corresponding stage in water.

When the third stage of the oil quench is reached, temperature gradients in the work are low and transformation to martensite is more even throughout the piece. Thus, danger of cracking and warping is decreased.

Moderately or highly alloyed steels can be oil quenched for full hardening. The steel selected must have a critical cooling rate low enough to permit complete transformation to martensite during the slow third stage of the oil quench. Oil hardening steels are specified for parts when design limitations and applications make it necessary to avoid the possibility of cracking and distortion in the more severe water quench.

Many types of quenching oils are on the market; selection of a particular oil depends on the hardenability of the steel and the desired structure and properties. Oils should possess a high degree of stability with continued use, high flash point to reduce fire hazards, and low viscosity for faster heat transfer and less oil loss when parts are withdrawn from the bath.



Courtesy A. F. Holden Company

Fig. 3. Quench tanks agitated by motor driven propellers are integrated into this salt bath heat treating line.

Effectiveness of oil quenching is increased in some applications if the oil contains additives which promote greater wetting action in the early stages of the quench. The increased contact of the oil with the surface of the part speeds up the vapor blanket and boiling stages.

Uniform agitation of the bath has a marked effect on the cooling rate of oil. As with water and brine quenches, the severity of an oil quench can be greatly increased by increasing the turbulence of the liquid. Heated quenchant is thus moved away from the work to other areas of the tank, allowing the entire volume of the liquid to come in contact with the work for greater heat transfer. Bath temperature is usually maintained at between 90°F and 140°F.

Interrupted Quenching

Hot quenching or interrupted quenching methods have been developed to minimize distortion, cracking, and dimensional changes. These increasingly popular treatments use agitated baths of molten salt, molten metal, or hot oil.

The hot steel is immersed in the bath which is maintained at a constant temperature between 300°F and 900°F. It is held there until the temperature throughout the piece is uniform and then is removed and air-cooled to room temperature.

Transformations in the steel are thus delayed until all parts of the piece are at the same temperature. This eliminates cracking and distortion since the entire cross-section changes at the same time. Martempering and austempering (see "Metallurgy of Heat Treating," July '59, p. 48) are widely used interrupted quenching methods based on these principles.

Equipment for Quenching

Manufacturers of heat treating equipment have made available

a wide variety of quenching tanks ranging from small portable units to mechanized quench lines. Equipment has kept pace with the latest metallurgical developments and includes simple open tanks, integral quenching units for use with controlled atmosphere furnaces, and units for precision quenching operations such as austempering and martempering.

Quenching tanks should be located near the furnace and should have capacity for the volume of liquid required for efficient controlled cooling. The volume used depends on the size of the work, the desired production rate, and the temperature at which the bath is to be maintained. When steel is cooled from a temperature near 1550°F the heat is transferred to the bath causing an increase of the bath temperature. The volume of the quenching medium must be sufficient to limit this increase to a specific range.

Methods of removing heat from the bath include the use of submerged pipe coils, or plate coils suspended in the quenching liquid; each type of coil contains circulating cold water. Pumping of quenching liquid through external cooling units and use of heat exchangers are other methods employed.

Circulation of the quenching medium by agitation of the bath helps to maintain a uniform temperature in all parts of the tank. The important effect of agitation on the cooling rate has already been discussed. Circulation of the quenchant must be uniform, however, or the desired results will not be obtained. A flow of liquid past only one side of the workpiece will result in non-uniform heat extraction. This often leads to distortion, soft spots, or cracking.

Propeller agitation is the most effective method for maintaining uniform turbulence of the quenching medium. The number of propeller agitating units used depends on the capacity and design of the quench tank. Propellers must be positioned so as to secure the most effective results for the particular workpiece being cooled and the quench tank design.

Dies and fixtures are sometimes used to prevent distortion of quenched parts. They hold the work rigidly to prevent changes in contour. In some applications the quenching dies are water-cooled and thus serve the double purpose of forming the part and extracting heat from the work. Conventional methods of holding individual workpieces in tongs or suspending baskets of parts are more economical and are generally used except where particular requirements justify the cost of quenching dies.

Metallurgical theory, skillful techniques, and proper equipment are essential for good quenching procedures. When these three factors are applied to all of the other important steps in heat treating they can provide quality results. end

Extra copies of this article are available while supply lasts. Write Tooling & Production Magazine, 1975 Lee Rd., Cleveland 18.

Die Metal Solves Tough Drawing Job

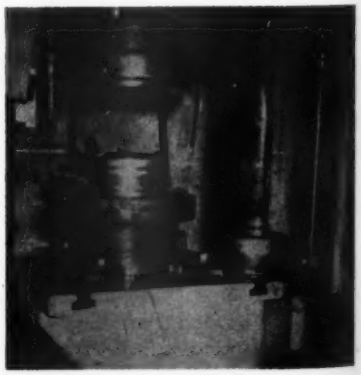
Punches and dies made of type GA Meehanite Metal were the solution to a Norwegian firm's problems in drawing kitchen ware from 0.7 mm thick type 304 stainless steel blanks.

The Polaris Fabrikker company sought a die material strong enough to resist the pressures which, as a result of work hardening of the blank, would rise from 2850 psi at the beginning of the operation to 7800 psi at the end. Binding of the steel blank to the die and punch surfaces and scratches on drawn parts because of structural defects of the punch and die materials also had to be avoided.

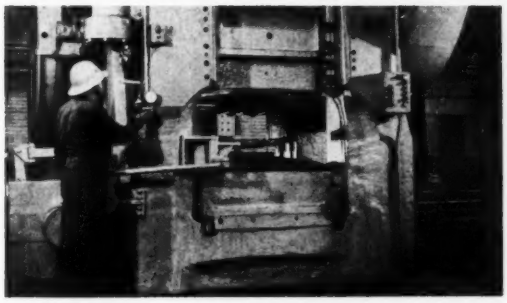
After several trials they found that the Meehanite castings filled these requirements. The castings, which contain graphite particles for self-lubrication, were heat treated to enhance service life. Close tolerances achieved in casting the Meehanite punches and dies reduced the machining time, which had been extensive on the special steel and bronze castings formerly used. The Meehanite dies and punches were used on a 139-ton hydraulic press for from 12,000 to 20,000 drawings, depending on the size and shape of the dies, before re-dressing.

Fig. 1. Meehanite drawing dies and tools for making stainless kitchen utensils show a high polish.

Fig. 2. Stainless steel sauce pan is formed with Meehanite drawing die.



Use Your Press Tonnage Wisely



The usual method of determining a safe load for a forging press is to have an experienced operator listen to it while a forging is being made and observe its operation. To back up an operator's judgment we use a tonnage indicator. *By indicating the load, the operator knows if he is overloading and shortening the life of the press.*

TAKE A 2500-TON PRESS being used for forging automotive ring gears. The gears may be something like 9½" OD, 1½" thick, and have a 5½" dia hole. They may be made from a round-cornered square billet started by setting on end in a buster die to shorten or pancake to about 2½" high with a load of 380 tons. The hot steel is then placed in a blocker die to forge it into a doughnut with a thin web, using a load of 1120 tons. The part may then be placed in the finish die to complete the forging at a load of 2840 tons.

The operator will look at the finished forging to see if it has too much flash. If it does he knows it's well filled, but it probably is too thick (not to size). He will then measure the web to find the extra thickness, and place a shim under the blocker die to reduce the web by forcing more stock into the ring. He may have to reduce the length of the billet to help cut down on the flash.

His next consideration is the finish die. If the flash land outside the die is too wide, the die is sent back to the die room and the flash land reduced. Another

Mr. Sanford is Design Engineer at Erie Foundry Company, Erie, Pa.

by Robert Sanford

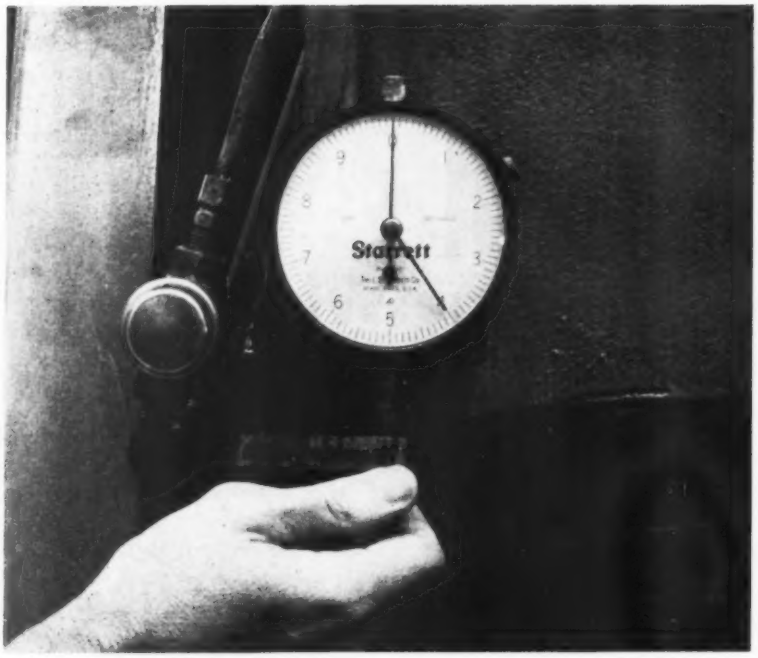


Fig. 1. Press indicator must be adjusted back to zero in order to show tonnage on next hit. The 0.004 reading from previous hit, on a 2500-ton Erie press, represents a 1600-ton pressure used on that operation.

forging is made; this time the tonnage on the buster is 370, the blocker is at 1430 and the finisher at 2300. Now the forging is down to size, filled, and the flash is about right. The load on the finish was reduced by 460 tons, indicating more work being done in the blocker for a more even distribution of work. And, the press tonnage was not exceeded.

A dial indicator is used to determine the load on the dies by measuring the elongation of the frame as the ram pushes the dies together. The indicator has a "Limit Hand" which is carried by the regular indicator hand to the maximum load position and left there. This allows the operator to read the tonnage after the stroke is completed. The Limit Hand may be returned to zero by a knob on the outside of the indicator. With this aid the operator or die setter can easily check the tonnage used on any die.

In utilizing the stretch in the press frame as the ram pushes the dies together, we measure the stretch or elongation from a point above the eccentric shaft down to the indicator. By calculation we know a reading of 0.001″ equals a 400-ton load and we easily get the total load. A reading of 0.00625″ would indicate a load of 2500 tons on the die, or full tonnage of the press in question.

To adapt the press a 63″ rod is clamped to the press frame above the eccentric bearing. The lower end of the rod slides freely through the bracket that holds the dial indicator to the lower frame. An arm is held by a cap screw to the lower end of the rod and has a fine screw thread that bears against the tip of the indicator. The screw is adjustable to set the indicator at zero. As the frame of the press elongates under load, the lower end of the rod is free to move and this movement is measured by the dial indicator.

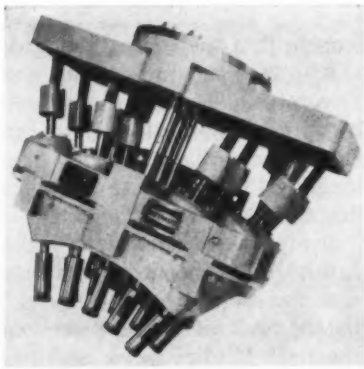
After a die setup is complete and tonnages to make a forging are known, the dial indicator is removed by taking out one screw. Since an indicator is delicate it should be respected.

Although it has great importance as a tool for diagnosis, the most important function of the Tonnage Indicator is to show when the press is overloaded.

end

Drillhead Has 10 Tilted Spindles

A new drillhead drills holes at an angle at the same time that straight holes are being drilled parallel to the direction of machine feed. The fixed center, ball bearing angular-type head has 10 equally spaced spindles in two straight rows. To permit drilling of all holes radially, each pair of spindles is at an 11° angle with the adjacent pair. An included angle of 44° exists between pairs of outside spindles.



In operation, the main body of the head remains stationary; the spindles are linked to the power source by the upper casting, which is attached to the drilling machine. To provide adequate support, the head contains two guide rods and a machined pad. The drillhead was built by Thriftmaster Products Corp., 1012 A Plum St., Lancaster, Pa. For details, Circle Inform-A-Gram No. A-1.

Restrictions on Patent Licenses

by Albert Woodruff Gray

Patentees may require and obtain restrictive licensing clauses, but not to build up a monopoly, as studies of some recent court cases show.

LICENSES FOR THE USE OF A PATENTED device for the detection of flaws in metal, a "Reflectoscope," were granted by the patent owner only to licensees who were not competitors.

By these instruments ultrasonic sound waves having a higher frequency than that audible to the human ear and capable of penetrating solid, liquid, and gaseous material are propagated into a metal part. These waves travel through the metal at a known speed, characteristic of the material of the part under inspection.

When the waves reach the opposite surface of the part or encounter discontinuities or flaws in the part under inspection their echoes are reflected back to the origin. Reflections from flaws nearest the entering end of the part arrive at that point before the reflections from the more distant discontinuities and sooner, naturally, than the reflections from the opposite surface.

As these various reflections reach the entering surface of the metal part they are amplified, and by means of a sweeping motion of a beam of cathode rays they are registered on a cathode ray oscilloscope in a manner that permits the determination of the time of the travel of the waves and the location of the flaws in the part.

Sales of this device were restricted by the patentee to purchasers and users who are not competitors. When later suit for the infringement of the patents of this instrument was brought by the patent owner, this limitation of its sales to non-competitors was set up as a defense.

By this restriction, it was contended, the patentee had violated the federal antimonopoly laws and, as a consequence, it had forfeited its right to protection under the patent statute, since it was before the court with "unclean hands."

Of this defense the court said, "These alleged infringers concede that a patent is a grant of the right to exclude others from using the invention but they advance the novel argument that a refusal to sell the inventions for the purpose of preventing competition with the patent owner in their use, is an unlawful enlargement of the grant.

"Merely to state the argument is to expose its fallacy. The argument rests upon the presupposition that by its exclusive use of the patented device in its commercial test business the patentee obtained an unfair advantage over its competitors in such business. However the advantage the patentee enjoys is the result of a right conferred upon it by the Constitution and statute and takes nothing from its competitors to which they were entitled under the law."[1]

Then as authority for its refusal to sustain this defense the court referred to the decision of a controversy before the United States Supreme Court involving similar patent license restrictions in the use of vacuum tube amplifiers. To about 50 manufacturers licenses of these patents had been granted for private or home use.

Danger of Monopoly

To these licensees the patents were licensed, "Solely and only to the extent and for the uses hereinafter specified and de-

Mr. Gray is a lawyer and legal writer, having graduated from Yale and New York Law School, practiced law for 15 years, and written "Purchase Law Manual" and numerous articles.

Patents Available

Among the government-owned patents now available for license, you may find the new product you've been looking for or the start of your own business. The patents are licensed at no charge for non-exclusive use. You'll have to do the hunting, use your imagination, and perhaps do some more engineering, however.

Seven booklets, **"Supplement No. 2, Patent Abstract Series,"** describe these patents for various fields. The abstracts contain the basic idea of the invention. For information, write Publications & Public Information Division, Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C.

fined, to manufacture and to sell only for radio amateur reception, radio experimental reception, and radio broadcast reception licensed apparatus so manufactured by the licensee."

This clause had here been attacked as an illegal extension of the patent monopoly. "Any use beyond the valid terms of a license is, of course, an infringement of a patent," said the court.

"If, where a patented invention is applicable to different uses, the owner of the patent may legally restrict a licensee to a particular field and exclude him from others, this licensee was guilty of an infringement when it made the amplifiers for and sold them to this corporation. And as the corporation ordered, purchased and used them knowing the facts, it also, was an infringer."

To this the court added a brief summary of the principles of the law governing such situations. "That a restrictive license is legal, seems clear. The patentee may grant a license upon any condition, the performance of which is reasonably within the reward which the patentee by the grant of the patent is entitled to secure."

Then of the makers and users of goods that in their manufacture and sale are outside the license grant, the court said, "As the restriction was legal and the amplifiers were made and sold outside the scope of the license the effect is precisely the same as if no license whatever had been granted the manufacturer.

"And as the purchaser knew the facts it is in no better position than if it had manufactured the amplifiers itself without a license. It is liable because it has used the invention without license to do so."[2]

Features of these patent licensing agreements that will be protected and enforced were highlighted a few years ago in a suit for the infringement of patents of rotary drilling bits used in oil and gas drilling.

Bits of this character were delivered by the patent owner under an agreement in which it was stipulated, "Hughes Roller Rock Bits and Core Bit Heads are never sold but are leased. When the original cutter teeth and/or bearing have served their useful life the user will surrender the bits to Hughes Tool Company upon request. In accepting delivery the user agrees not to surrender any of the tools as mentioned above, to other than a duly authorized representative" of the Hughes company.

Legal Restrictions

Of the claim of an infringer that such a stipulation violated the antitrust laws and left the patentee without the protection of the patent law against infringement by virtue of its "unclean hands" the Federal court asserted:

"In licensing the use of his patented device the patentee may impose restrictions on the use thereof by the licensee, either as to time or space, or any other restriction upon the exercise of the granted privilege, save only, that he may not attach a condition to his license that will enlarge the monopoly granted him by his patent and thus acquire a monopoly which the statutes and the patent did not give him.

"Had the lease agreements, instead of providing for the termination when the useful life of the original cutter teeth and/or bearing ended, provided they should terminate on specific dates, the use or repair of the bit leased under such an agreement after the expiration date stated therein, would have constituted infringement."

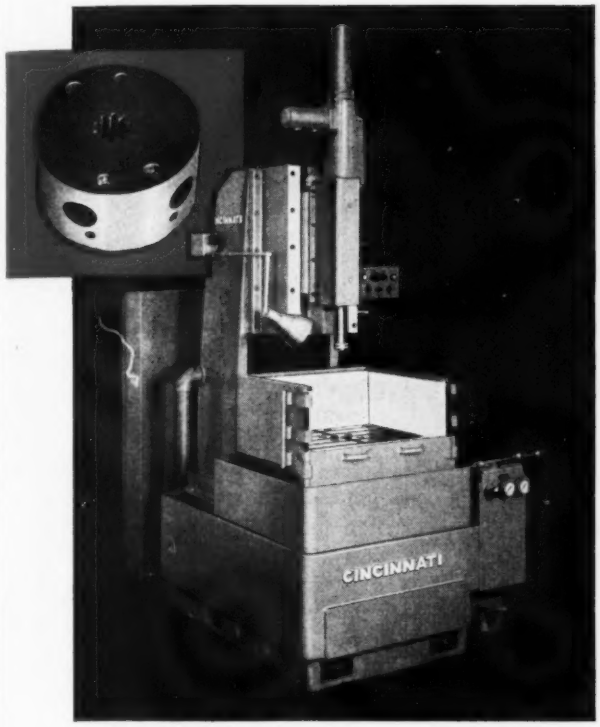
This the court supplemented with a catalogue of the restrictions imposed by virtue of the antitrust laws on patent license restrictions. "The patentee in granting a license may not (1) require a licensee to purchase unpatented goods for use with the patented apparatus, (2) prohibit the use by the licensee of goods of a competitor, (3) condition the granting of the license upon the acceptance of another and different license, (4) control the resale prices of patented articles after he has sold them, (5) use his patent to protect an unpatented element from competition, or (6) otherwise enlarge the monopoly granted by the patent.

"But here, as we have indicated, the patentee by the lease agreement merely imposes a

CINCINNATI Elektrojet
ELECTRICAL DISCHARGE MACHINE

ELEKTROJET

35 GIVES YOU A CHOICE OF ELECTRICAL DISCHARGE MACHINES



NO. 1 ELEKTROJET *with non-rotating workhead. Typical work is the extrusion die above, about 2⅞" OD. Operation, EDM gear teeth through center.*

NO. 3 ELEKTROJET. *This machine has the capacity for large heavy work, like the 15" long dies illustrated here.*

Advantages offered by electrical discharge machining are greatly extended by Cincinnati's new line of Elektrojet Machines. There are 35 variations in the line, covering the requirements for unusual or "impossible" machining operations on a wide variety of parts ranging from small missile components to forging dies. Elektrojet Machines are designed from the machine tool builder's viewpoint, with a high degree of dependable performance in mind.

Four styles of workheads are available: non-rotating, rotating, ram-type and universal. For all of them, a servo feed unit maintains proper gap between electrode and work to assure maximum efficiency of metal removal. Other beneficial features: two styles of work tables, fixed or adjustable . . . four styles of dielectric tanks, solid, open front, disappearing or moving table . . . a selection of power supply units.

There are many other reasons why Elektrojet engineering and machines are the finest. Folder M-2077 contains the complete story. Write for a copy. **Milling Machine Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.**

KNEE TYPE AND BED TYPE MILLING MACHINES • DIE SINKING MACHINES
• CUTTER AND TOOL GRINDERS • ELECTRICAL DISCHARGE MACHINES

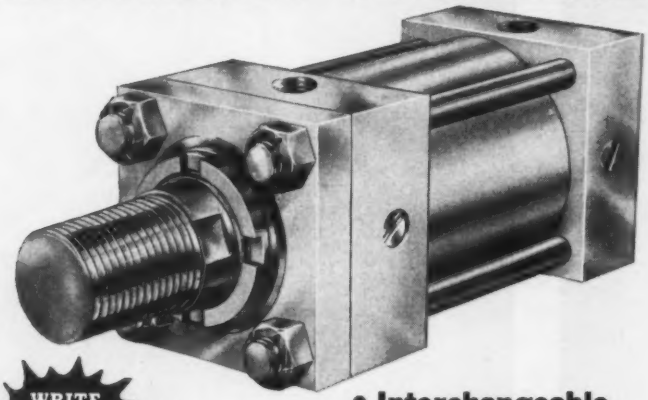
CIRCLE INFORM-A-GRAM KEY NO. 53

CINCINNATI
MILLING MACHINE DIVISION

For Smooth, Precise, Sure Power

SP NEW

HIGH-PRESSURE HYDRAULIC CYLINDERS



WRITE FOR CATALOG 117 TODAY!

• Interchangeable
• 100% J.I.C. Standards
2000 PSI (3000 PSI non-shock)
12 Bore Sizes: Compact 1⅛" thru 12"

Exclusive SP Features:

Quick Change Externally Removable Cartridge
Self-contained unit, easy to remove for servicing—no need to loosen tie rods or dismantle the cylinder.

"Clinch-Tite" End Seal
Maintains a leakproof seal at all pressures. An increase in internal pressure reduces the radial clearance at the pilot fit, eliminating "O" ring extrusion.

Interchangeable Cushion Adjustment and Check
Permits maximum installation flexibility; no clearance problem due to space-saving flush design; easy to adjust.

Heli-Coil® Insert Piston Lock
Permits quick, easy rod service without loss of thread strength; conforms to rigid aircraft standards.

A-766A

PROVEN QUALITY SP CYLINDERS · CHUCKS SPEED • PERFORMANCE

FREE Engineering Service
Representatives in principal cities
Phone or Write Today

Find us fast in the 'Yellow Pages'

THE S.P MANUFACTURING CORP.
30201 Aurora Rd. • Solon, Ohio

A BASSETT COMPANY • IN GREATER CLEVELAND • ESTABLISHED 1916

Non-Rotating and Rotating AIR and HYDRAULIC CYLINDERS • VALVES
POWER CHUCKS • COLLET and DRILL PRESS CHUCKS • ACCESSORIES

CIRCLE INFORM-A-GRAM KEY NO. 54

limitation as to the time the bits may be used, a limitation clearly within the range of its patent monopoly."[3]

Between the legal and the illegal licensing of patents is a sharp and well defined distinction that was emphasized recently in a decision of the United States Supreme Court. "Though often so characterized a patent is not, accurately speaking, a monopoly for it is not created by the executive authority at the expense and to the prejudice of all the community except the grantee of the patent.

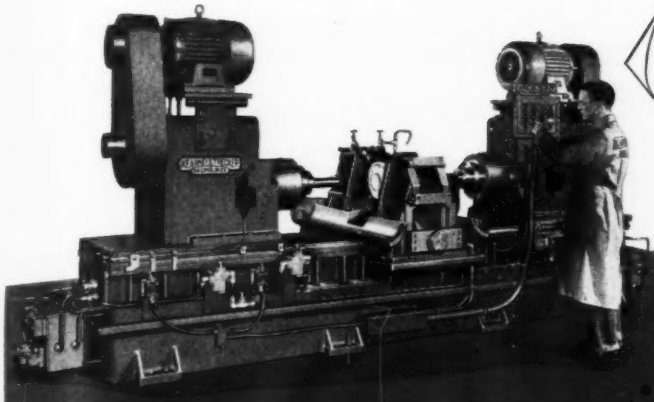
"The term monopoly connotes the giving of an exclusive privilege for buying, selling, working or using a thing which the public freely enjoyed prior to the grant. Thus a monopoly takes from the people.

"An inventor deprives the public of nothing which it enjoyed before his discovery but gives something of value to the community by adding to the sum of human knowledge. He may keep his invention secret and reap its fruits indefinitely. In consideration of its disclosure and the consequent benefit to the community the patent is granted. An exclusive enjoyment is guaranteed him for 17 years but upon the expiration of that period the knowledge of the invention inures to the public who are thus enabled without restriction to practice it and profit by its use.

Must Be Understandable

"To this end the law requires such disclosure to be made in the application for the patent that others skilled in the art may understand the invention and how to put it into use."[4]

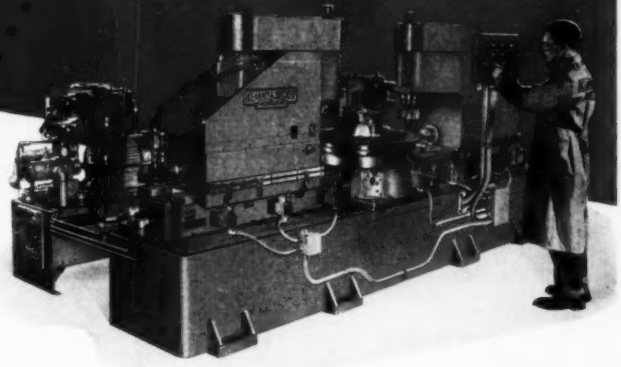
In contrast with this situation is an instance in which the owner of a patented product, tetraethyl lead, used for increased efficiency with gasoline motor fuel, licensed distributors and



CONSTRUCTION INDUSTRY

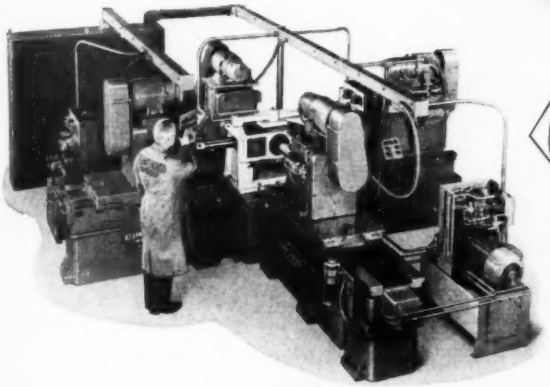
Only one setup is required to rough and finish bore, finish counterbore and face both sides of a tread roller for tractor-type construction equipment. Workpiece is hydraulically clamped . . . seven sizes of rollers can be machined. This method replaces a turret lathe using two setups. New rate is 13 pieces per hour.
Production up — 100%.

Kearney & Trecker builds PRODUCTION MACHINE TOOLS FOR EVERY INDUSTRY



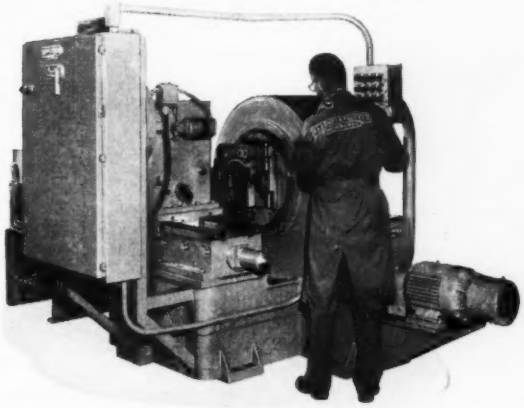
AIRCRAFT INDUSTRY

Rotary feed, bed-type machine with two opposed vertical spindles mills both sides of aluminum pump body flange to critical thickness and smooth finish *at rate of 76 pieces per hour.* Unit is versatile . . . as many as eight types of pump bodies are milled using only separate fixtures and cams.



ENGINE INDUSTRY

This unit bores four holes in engine block simultaneously . . . replaces horizontal milling and boring machine that worked just one hole per setup. Interchangeable inserts allow operations on any of four different workpieces. One feed slide unit handles interchangeable heads.
Production — 10 pieces per hour . . . up — 400%.



ELECTRIC POWER INDUSTRY

Two-spindle machine mills both inside and outside radii of curved alloy steel turbine blade section in a single pass *at three times the former feed rate.* Versatile 360° drum fixture handles 81 different blade sizes without overtravel on rapid stroke for extremely short cycle time.
Production up — 300%.

Write for bulletin SMD-57 on your company letterhead or phone — GReenfield 6-8300 . . . Direct Distance Dialing Code No. 414.

KEARNEY & TRECKER MILWAUKEE®

SPECIAL MACHINERY DIVISION
6800 W. National Ave. • Milwaukee 14, Wis.

SINCE 1898 . . . *Kearney & Trecker Customer Engineering Service — supported by an outstanding staff of engineers experienced in production milling machine design and application — combined with the finest and latest machine tools in an ultra modern plant, is always ready to solve your production problems.*

CIRCLE INFORM-A-GRAM KEY NO. 55

NOW! for the FIRST time HYDRAULIC FEED on a 10" x 16" grinder

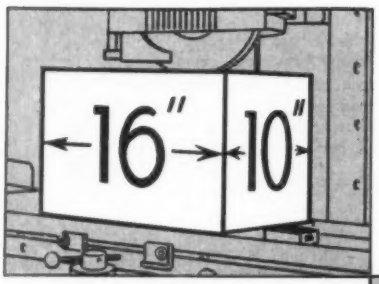
LOW COST Micro-Precision, High Speed Grinding

No. 17H Priced at only $3285.00

to give you the operating ease and high speed of hydraulic feed for little more than the cost of a hand feed grinder.

For precision surface grinding on tool room or production jobs, you can't beat the Covel No. 17H. The large grinding wheel with plenty of direct power *plus* high speed hydraulic feed and big cross-feed capacity make it a real money saver. *Grinds approximately twice as fast as with a comparable hand feed machine.*

FULL 10 INCH CROSS-FEED CAPACITY



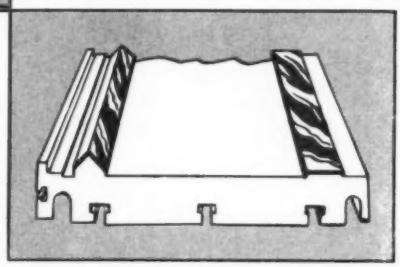
The full 10" cross-feed capacity of the Covel No. 17-H puts it in a class by itself among surface grinders in its price range. You get the extra working capacity you need for bigger jobs without paying a big premium in price!

HARDENED AND GROUND LEAD SCREWS have precision ground threads for smooth, accurate transverse and vertical feed.

PRECISION QUILL TYPE SPINDLE is grease lubricated and sealed for life. 2 HP, 1750 RPM direct drive motor.

FIRST WITH HARD CHROME TABLE WAYS

Available at extra cost for super long-lived accuracy. Hard chrome is applied direct to V and Flat table ways after hand scraping to master plate, preserving original built-in accuracy.



Micro-Precision a Covel Tradition-Since 1874

COVEL PRECISION GRINDERS

BENTON HARBOR, MICHIGAN

Write, wire or call us TODAY We'll gladly show you what the Covel 17H can do for you. Ask for Bulletin T-119.

CIRCLE INFORM-A-GRAM KEY NO. 56

refiners with a restriction against the sale by them to any except other licensed refiners and jobbers, retail dealers and consumers.

As a consequence, of the 12,000 jobbers in this country at that time, 11,000 were licensed by this patent owner and any jobber seeking to sell lead treated gasoline was compelled first to secure such a license before it could purchase from any licensed refiner. In its condemnation of a patent licensing agreement of this sort the court said:

"The patent law confers on the patentee a limited monopoly or power to exclude all others from manufacturing, using or selling his invention. The extent of that right is limited by the definition of his invention as its boundaries are marked by the specifications and claims of the patent.

"He may grant licenses to make, use and vend, restricted in point of space or time, or with any other restriction upon the exercise of the granted privilege, save only that by attaching a condition to his license he may not enlarge his monopoly and thus acquire some other which the statute and the patent together did not give.

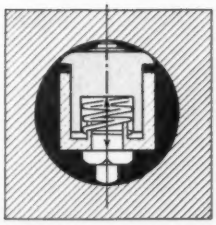
"He may not by virtue of his patent, condition his license so as to tie to the use of the patented device or process the use of other devices, processes or materials which lie outside the monopoly of the patent licensed or condition the license so as to control conduct by the licensee not embraced in the patent monopoly or upon the maintenance of resale prices by the purchaser of the patented article."[5] end

---

[1] Sperry Products, Inc. vs. Aluminum Co. of America, 120 U.S.P.Q. 362, Ohio, Jan. 5, 1959.
[2] General Talking Pictures Corp. vs. Western Electric Co., 305 U. S. 124, Nov. 21, 1938.
[3] Williams vs. Hughes Tool Co., 186 Fed. 2d 278, Oklahoma, Dec. 2, 1950.
[4] United States vs. Dubilier Condenser Corp., 289 U. S. 178, Apr. 10, 1933.
[5] Ethyl Gasoline Corp. vs. United States, 309 U. S. 436, Apr. 25, 1940.

Precision Requires Special Treatment

...AND GETS IT WITH FEDERAL DIAL GAGES!

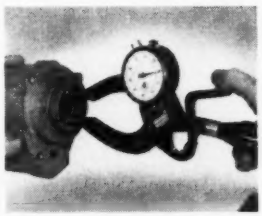


MODEL 1250 SERIES
Positive Centralization. Set directly to Gage Blocks or Micrometers. 4 sizes cover all diameters.

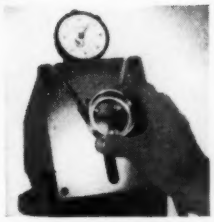
DEPTH GAGES
All types—knife edge, long range, special anvils and special types.

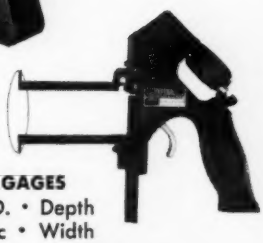
GAGES CAN BE MODIFIED SPECIALLY TO SUIT . . .

OVER 12 *TYPES* OF SNAP GAGES — *in all sizes . . .*



Stock and Special Caliper Gages of all Shapes





GROOVE GAGES
I.D. • O.D. • Depth
Concentric • Width

OVER 12 *TYPES* OF HOLE GAGES — *in all sizes . . .*

If you are not kidding yourself about Precision you know you have to gage a dimension a certain way if you want an accurate measurement.

That's why good gage users know that just *any* gage is *not* good enough. And that is why Federal makes so many different types of gages of the same general kind.

There are all degrees of accuracy required and Federal takes the care to obtain that accuracy.

And some need more gaging pressure, and some less, and some need narrow anvils and some need wide. Some want to gage just a hole diameter and some want to know if it's round or if it tapers.

MANY OTHER TYPES
Send for Catalog. Illustrates the most extensive line available.

It's easy to find the gage you need — get in touch with us. Do it now.

FEDERAL PRODUCTS CORPORATION
92311 Eddy Street • Providence 1, R. I.

Whatever You Need in Gages —

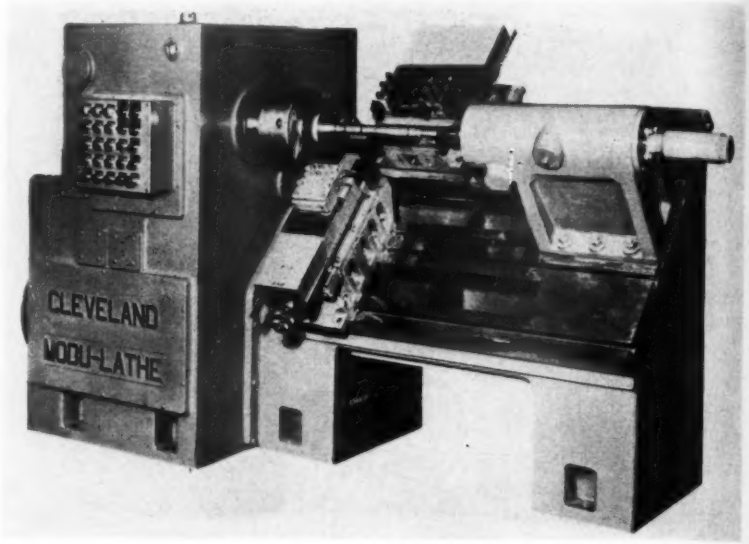
Ask **FEDERAL** *First*

CIRCLE INFORM-A-GRAM KEY NO. 57

More "Building Blocks"

The Cleveland Hobbing and Machine Co., a prominent proponent of modular construction, now offers what they call "an obsolescent-proof" lathe. Their lathe building block components are interchangeable and can be united in many combinations. The six heavy precision headstocks and four rigid beds can be combined "to suit," and with the addition of many "hang-on" components can satisfy almost any customer requirement. Since components are made in production lots, high quality is said to be available at a lower cost.

For the accounting-conscious, it is easy to see how the cost of capitalization could be low with this type of machine construction. In many instances, adaptations further than the headstock and bed, are considered as tooling, although in reality these additions may be components that are a fixed part of a machine of more usual construction.



(For a look at industry-wide acceptance of the building block principle, refer to T&P, July '59, page 35.)

An authoritative and complete coverage of every phase of . . .

PRODUCTION CONTROL

by NYLES V. REINFELD

Founder and Managing Director of the National Institute of Management, Inc.

BASED ON AN EXTENSIVE SURVEY, this comprehensive new book presents the results of seminars with more than 500 companies throughout the United States and Canada. The questions and the answers emerging from round-table discussions with more than 1500 production control men, as well as Mr. Reinfeld's pioneer experience in the field, form the nucleus of a completely practical and flexible guide. 340 pages; over 100 illustrations. $8.00

HUEBNER PUBLICATIONS, INC.
P. O. BOX 3505, 1975 LEE ROAD, CLEVELAND 18, OHIO

Please send ..... copies of "PRODUCTION CONTROL" at $8.00 each postpaid. (Ten day examination allowed; returnable for full credit or refund if returned in saleable condition.)

Company .....

By..... Title.....

Address .....

City..... Zone..... State.....

Open account shipments to rated companies. Otherwise, payment with order, please. No C.O.D.'s. Ohio customers add 3% sales tax.

5 machines in 1

LENNOX TRU-EDGE® METLMASTR

The "All American" Shearing, Forming and Piercing Machine

If you work in sheet or plate, here is the one machine that fits perfectly into your PROFIT picture! It eliminates costly dies and gives you complete operational versatility — Investigate now!

LM2

AVAILABLE IN FOUR MODELS

Write today for complete information on the METLMASTR

LENNOX

TOOL and MACHINE BUILDERS

637 N. Baxter Street • Lima, Ohio

See Them at Booth 916

A.S.M. Show — Chicago, Nov. 2-6

CIRCLE INFORM-A-GRAM KEY NO. 58

...see how this new ROTOR PENCIL GRINDER excels all others

- **THE FIRST BLADED TYPE AIR-POWERED PENCIL GRINDER** . . . now vastly improved . . . the New Rotor M1223 D-03S. Features:
- **NEW FULL-GRIP COLLET.** "Rubberflex" collet grips shank entire ½" length. Takes wider range of shank tolerances. Holds shank concentrically . . . minimizes "runout" to .002", reducing vibration, prolonging point and cutter life.
- **FRONT EXHAUST** . . . away from operator. Keeps work clean. Collet shrouded by exhaust deflector. (Side exhaust optional.)
- **STURDIER CONSTRUCTION.** Rugged, one-piece spindle and ball bearings of ample size assure long life, smooth operation, reduced "runout". Splined drive of rotor to spindle is stronger, gives better dynamic balance.
- **MORE POWERFUL BLADED MOTOR** (not a turbine). Full 40,000 rpm gives plenty of power for ½" diameter mounted points and burrs, or cutters. Greater power under load for higher cutting efficiency.
- **TRY IT!**—ask for free demonstration of the New Rotor M1223 D-03S Pencil Grinder!

Optional end cap with side exhaust (arrow).

ROTOR TOOLS®
CLEVELAND, OHIO

Here's the RIGHT TOOL for YOUR job!

ROTOR AIR TOOLS: Assembly Tools • Drills • Small Wheel Grinders • Straight Grinders • Vertical Grinders • Scalers • Chippers • Rammers • Special Tools • Air Motors
ROTOR HIGH-CYCLE ELECTRIC TOOLS: Grinders • Polishers • Sanders

CIRCLE INFORM-A-GRAM KEY NO. 59

Who Gets That Promotion?

A guide for 'promoters' and 'promotees'

SOMETIMES AVAILABLE PROMOTIONS are obvious, but more often the choice involves many detailed considerations. Here, from a careful study of selection methods used by more than a score of manufacturers are major considerations which may be applied to individuals in determining who should be promoted. These, plus others pertinent to the individual job, can be listed in a "rating chart" to make selection easier and more reliable. Rephrasing the points can outline qualifications a "'promotee" should concentrate on cultivating.

• Does he keep the quality of his work exceptionally high every working day? When promotions are in the offing many workers suddenly become quality conscious. Past as well as present work performance, however, must be taken into account. The one who keeps standards high as a matter of routine will carry through in the new job.

• Can he report in clear and understandable terms? If no such work has been done by the individual in the past, some tests may answer the question.

• Is he continuously improving his own knowledge of the work? The man who will be worth anything at all in the new job is seldom the one who depends solely on acquired knowledge to get the job done.

• Does he know what to do in out-of-routine, as well as routine situations, without being given detailed instructions? The individual who lacks the ability to handle such problems can hardly be expected suddenly to acquire techniques as he supervises others. Out-of-routine situations occur frequently. How well each man has handled these in past work posts is a valuable indicator of his abilities.

• Can he stimulate the work of others around him? Some people, by second-nature, have this valuable trait. Others, no matter how much they pressure themselves, never acquire it. It is invariably apparent in any employee's day-to-day working habits. It is most necessary in any "better job" to which he may be promoted.

• Is he the type of worker who takes the unpleasant parts of a job in stride? The higher anyone goes in any organization the greater degree of such unpleasant tasks; he must have the ability to handle the small ones which face him in his present job if there is any possibility of his being able to tackle them in the future.

• Can he keep records which are essential to the new job? Don't take a chance on promoting a man who is incapable of handling this phase of the new job. If you don't know, test the candidate.

• Has he always tried to do just a little more than his job called for? The man who does no more than required to hold onto his job, even though handled with efficiency, is not a prime choice for a better job where such willingness to put forth maximum effort will affect not only himself but those working under him as well.

• Is he flexible and not fixed in his way of doing things? An individual may be qualified for his present job without such flexibility but utterly valueless in another. If the new job requires such flexibility, this is a factor of the utmost importance in weighing the merits of available candidates.

• Has he demonstrated interest in and loyalty to the company? This may not be so important, so long as a man does an acceptable job, at lower levels but the higher he climbs on the staff the more important such loyalty becomes.

• Is he orderly? The man who

by Ernest W. Fair

Hundreds of parts machined, plastic molded, stamped...

YET I-T-E'S INSPECTION FORMULA GUARANTEES PRECISION AS PRODUCTION RATES MULTIPLY!

Optical gaging inspects these tiny circuit breaker parts, in some cases seven times faster than hand methods. Permits more thorough, often more accurate, inspection of linear dimensions, hole diameters and locations, radii, angles and contours.

"We've found a practical method to retain precise quality in the many small parts we make to go into our circuit breakers," says the Small Air Circuit Breaker Division of I-T-E, in Philadelphia.

"That method makes *full* use of optical gaging with our Kodak Contour Projectors. They're in constant use to improve our quality and avoid production headaches at the same time.

"Starting in *receiving*, all components from our suppliers are optically checked to save later production snags. Tool and die samples and experimental parts in the *tool room* are optically checked. And finally, we inspect parts right in the *production* line. This way, inspection bottlenecks just don't happen."

Here are just a few reasons why I-T-E and other firms find inspection with a Kodak Contour Projector fast and accurate:

Parts and fixtures are easy to set up, even large parts.

You have a constant 8″ of working space regardless of magnification.

You can easily see and check what you're inspecting because there's brilliant, uniform illumination over the entire screen area, and the image is always erect and unreversed—at any magnification you select.

To learn more about these and other features of the Kodak Contour Projector and how they can ease your inspection problems, write for the booklet, "Kodak Contour Projectors."

Special Product Sales

EASTMAN KODAK COMPANY, Rochester 4, N. Y.

the KODAK CONTOUR PROJECTOR

Kodak
TRADEMARK

CIRCLE INFORM-A-GRAM KEY NO. 61

isn't orderly and neat about his work routines can't enforce this upon others. The net result may be that an entire department, over which he has supervision, quickly drops to his levels of disorderliness.

• Has he shown a definite desire for promotion within the company? Management can never expect maximum performance from an individual who has never demonstrated the desire for promotion, nor is he likely to pass along enthusiasm to those he supervises.

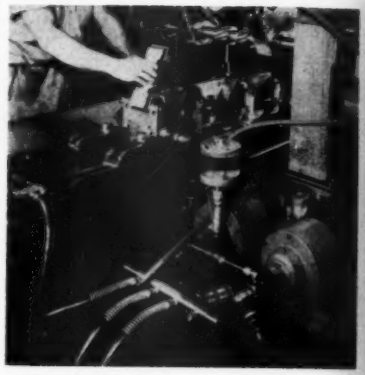
• Can he think things out where there are no precedents established? Any reasonably intelligent individual can "follow the book," but it takes a little something extra to handle situations which are not covered by such precedent. Picking the men who possess such ability will always lessen top management chores in any company.

• Can he do his job without strain and yet show no sign of "loafing?" The higher the individual climbs the more essential it will be that he possess such ability.

• Does he look for ways to do the job better? Where this has not been evidenced in the individual's regular work routines in the past it should be given the closest study in considering his status insofar as a promotion is concerned. end

IF IT'S
DURABLE
IT'S
DEPENDABLE
Durable Punch & Die Company is your one best source of information regarding metal and plastic piercing applications. Durable's engineering know-how helps solve perforating problems. Durable's perforators punch straight holes to reamer accuracy; hold close tolerances; perforates at angles; pierces round stock. They too have proven their value in cold piercing straight, burr free holes in Phenolic laminated plastics. Durable perforators give longer punch life because they are completely supported, vertically lapped and chrome plated to retard firing and galling, and to provide for easier stripping.
Write for Durable Engineer's Handbook. 121 pages, 100 illustrations. No obligation.
Patented and made exclusively by
DURABLE PUNCH & DIE COMPANY
9030 South Hermitage Ave., Chicago 20, Illinois
CIRCLE INFORM-A-GRAM KEY NO. 62

Mobile Power Unit Speeds Milling

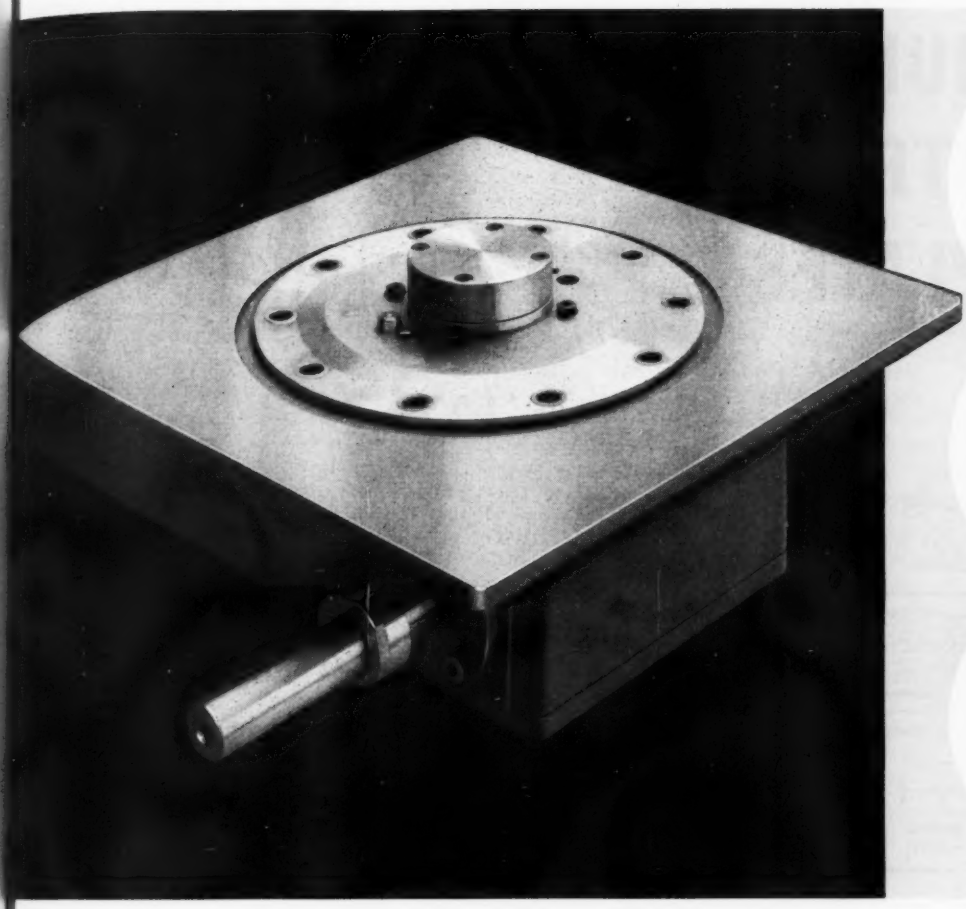


A portable power source for PowRlock automatic setup clamps has enabled Mission Manufacturing Co. to speed machine loading, cut production time, and save on tooling. The clamps, made by Wilton Tool Manufacturing Co., Inc., are operated automatically by an air-hydraulic booster system. They were built into fixtures used for slabbing the face of plug valve core halves, and fixtures used for holding carbide rock bits that are milled.

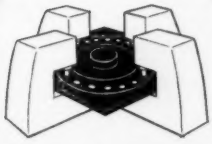
Mission equipped the air-hydraulic boosters with quick disconnect couplings and a self-feed system that compensates for loss of hydraulic fluid and acts as a bleeder. The entire booster unit was then mounted on portable tables which can be moved from machine to machine.

Economical, Versatile, Absolutely Accurate Automation!

Federal Dial Feed Indexing Table



Mount Indexing Table on your own presses



Use with drill presses, air cylinders, drills and tapping heads

Mount on all Federal Presses

performs up to 300 indexes per minute!

The Federal Dial Feed Indexing Table performs hundreds of operations that formerly required specialized, high-priced equipment. Its application is limitless. Use on your present equipment, on Federal Presses, or independently with air cylinders, drills and tapping heads, or drill presses. The savings in tooling costs—in greatly increased production are almost unbelievable. Performs up to 20 multiple station operations—delivers up to 300 indexes per minute. Cam-type indexing mechanism assures perfect accuracy—smoothest operation. Absolute alignment is assured as "shot-pins" enter index holes after each index of the dial. A "safety pin" automatically stops press—*protecting the dies*—should misalignment occur for any reason. Gear or chain driven. Automatic parts feeder and ejector optional. For presses of up to 100-tons. Write for data, plus information on Federal's rebuilding facilities.

CIRCLE INFORM-A-GRAM KEY NO. 63

Federal Press Company, 907 Division Street, Elkhart, Indiana

FEDERAL *Open back Inclinable* PRESSES

35 Years of Quality Construction

Six Ways to Save... ON ALUMINUM BRONZE WEAR STRIPS AND WEAR PLATES

MEET JACK: *A ficticious character we have chosen to illustrate a non-ficticious story*

LENGTH

Jack needed 4 rectangular wear strips, each 36" long. Always before, he ordered 8 castings, each 18" long and had to splice them together. NOW . . . Jack has found out about MEIER WEARITE EXTRUDED ALUMINUM BRONZE RECTANGLES and how it comes in any length up to 10 feet long, so he specifies the exact length.

AVAILABILITY

Jack used to have to wait 2 or 3 days for castings, since that is the usual required time to have them made up. Now Jack orders Wearite and gets it right off the shelf of the local distributor, which saves him time.

SIZE (On a 1X3 wear plate, for example)

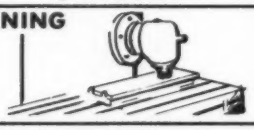
CASTING 13.4#/FT. WEARITE 9.8#/FT.

There was a time when Jack would have to order his castings oversize and machine them down to the required size. Jack did this to get rid of the sand inclusion which was around the surface. "Why wear out good cutting tools to remove excess scrap" Jack reasons. "With Meier Wearite little or no 'cleanup' work is required, and I can choose from *94 different sizes* of stock."

QUALITY

Jack has found out since he has switched to Wearite that the new metal is a "quality" metal. WEARITE EXTRUDED RECTANGLES are produced from semi-continuous cast billets under the strictest of laboratory control. This makes them tough and longer lasting.

MACHINING



When machining is required, Jack has found that he prefers the Wearite to castings. Extruded metals are free from porosity and have a homogenous structure; this makes Wearite easier to machine.

COST

But what makes Jack really happy . . . REALLY, REALLY happy . . . is that besides all of these advantages he has found that pound for pound of usable metal MEIER WEARITE EXTRUDED ALUMINUM BRONZE RECTANGLES COST LESS!

Meier BRASS & ALUMINUM Company

1471 E. NINE MILE RD., HAZEL PARK (DETROIT) MICH.

Write for free catalog *Distributor inquiries invited*

CIRCLE INFORM-A-GRAM KEY NO. 64

Duplicate Prints Improve Account Control

by Joseph C. Marek and Victor J. Marek

CONTRACT MANUFACTURERS PROVIDING PROTOTYPE SERVICES for larger industries take pride in the accuracy of their design and the quality of their production. Accuracy and quality have been assured at Victor through account control procedures which utilize whiteprints, produced by a low-cost Blu-Ray rotary diazo machine.

Our experience has shown us the need for establishing an account control for each job that comes into the shop. A number of jobs are "quick and dirty," of course; these are relatively simple to control. Others, however, are close and critical, involving complex operations and frequent checks with the customer so he can be assured that he is getting what he contracts for.

Close supervision of complex jobs is very important, since we are often given the responsibility for design as well as production of prototypes. The whiteprints provide the customer with a fast, yet economical record of an original design. He then knows exactly what's happening and can make any changes that may be required. This is important because sometimes the bare specifications do not tell the complete story. Original layouts are kept on file in our office, so that we always have a clean print of exactly what has been ordered.

Mr. J. C. Marek is Plant Manager and Mr. V. J. Marek is Tool Designer at Victor Tool & Manufacturing Company, Higganum, Conn.

Shortly after we instituted this system we realized many dividends. A progressive die and two form dies were designed for a customer and even though he had approved the design and made his recommendations by rough sketches, we sent him prints of the finished layout. When these prints were examined carefully, the customer found that original specifications were not adequate and that an additional operation would be required. If we had gone ahead and built according to original specifications, without sending copies of the layout for final checking, this customer would have lost several weeks of lead time and would have incurred additional costly expenses.

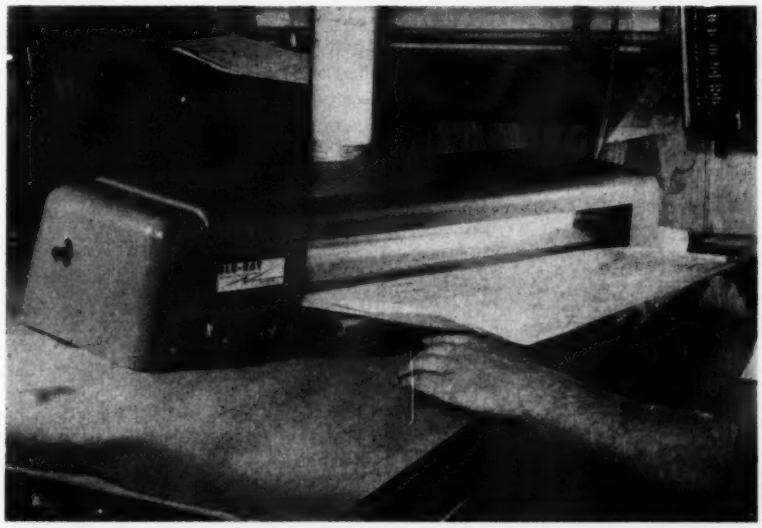
In Victor's account control setup prints are provided at each stage of the operation, so the customer always has the control he should have over the job he wants done. The principal benefits of this procedure are a savings in time, the establishment of good will, and the elimination of error.

The whiteprinter also figures in our internal operations, for we can make several prints in a matter of minutes and can use the prints for marking changes, keeping the original on file in our office. Previously, sketches were made on an original layout and this original was passed around the shop. After several handlings the original became smudged, often so badly that picking up or checking dimensions became a problem.

The whiteprinter is also used for specialized forms, such as job cards and quotation and inventory forms because it is convenient and economical to use.

An added advantage of duplicating prints in our shop is the element of safety involved in protecting those contracts which are deemed confidential by either the contracting company or the government. With our own print duplicator we can assure the customer that the original design layout and all copies are safely in our custody. end

Whiteprinter used at Victor Tool Manufacturing Company to provide customer with prints of design at each stage of operation.



DIE SET DATA

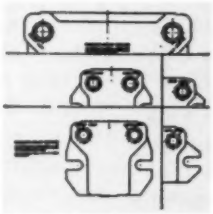
available from PRODUCTO

Die Set Catalog No. 11

This easy-to-use general catalog contains compact, complete listings and illustrations of Producto's broad line of die sets and die makers' accessories. There's a separate price book with *net* prices. A unique new binding enables you to have the technical data and price information side-by-side—no flipping back and forth required. *Color* spotlights key information and speeds up your use of the catalog. Many important new accessory items are included. Free.*

Die Set Digest

Every issue of this 8-page quarterly publication is packed with valuable hints for designers, manufacturers and users of dies. Hard-to-find information is presented clearly in the *Digest:* "Die Set Maintenance in the Pressroom"; "How to Select and Use Die Springs"; "How to Lubricate for Longer Life". Write and ask to receive *Die Set Digest* regularly. No charge.*

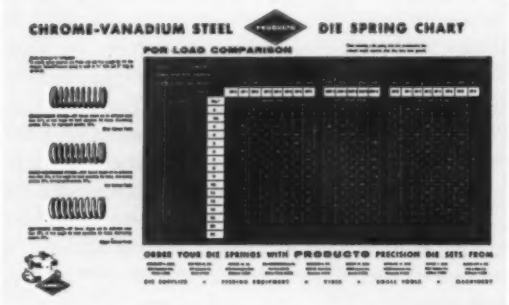


Die Set Templates

Accurate full-size templates for Producto rear-pin die sets. Save time and simplify layout for the busy die designer. $3.50 set. Write today.

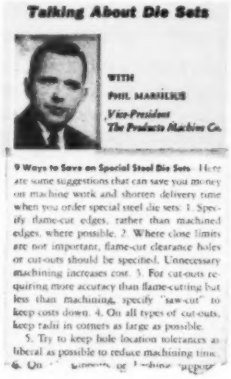
Die Set Specification Stamp

Rubber stamp for tracings, prints. Provides spaces for die set ordering information. Free.*


CHROME-VANADIUM STEEL
DIE SPRING CHART
FOR LOAD COMPARISON
ORDER YOUR DIE SPRINGS WITH PRODUCTO PRECISION DIE SETS FROM

Die Spring Comparison Chart

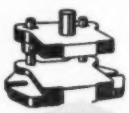
Die spring selection is simplified by this 12″ x 20″ chart in two colors, suitable for wall mounting. Convenient for use at the drawing board, bench or in the stockroom. Covers all three series of Producto chrome-vanadium die springs: Medium-pressure 50% deflection, Medium high-pressure 37% deflection, and High-pressure 30% deflection. Free.*



Ad Reprints

Valuable die set know-how is provided in recent "Talking About Die Sets" columns: *How to Save on Steel Specials, Steel vs. Semi-steel,* and others. Send for complete file, free.*

*WRITE TODAY for these useful and informative diemaking aids. Requests on company letterheads will be filled promptly.



THE PRODUCTO MACHINE COMPANY
945 Housatonic Avenue, Bridgeport 1, Connecticut

Wherever die sets are used

PRODUCTO

PRODUCE MORE WITH PRODUCTO PRECISION DIE SETS

NEW

Gardner-Denver "Airfeedrill"® with "aircheck" feed control

Check these "aircheck" features

- √ Low initial investment . . . simple to maintain . . . economical to use
- √ In-line hose arrangement
- √ High-speed feed with slow break-through for clean holes
- √ Closer center-to-center mounting
- √ Short over-all length
- √ Develops full ⅓ hp

NOW

simple, easy, low-cost automation of many drilling setups

Now it's easy and inexpensive to automate drilling such materials as plastics, wood, aluminum, steel, cast iron and sheet metal. Engineer an automatic drilling setup with new Gardner-Denver "Airfeedrills" with "aircheck" feed control.

These versatile new drills are easily adaptable to almost any drilling setup. You mount them as a drilling unit of two, 20 or more spindles for automatic hole processing. Use one as a stationary drill mounted on an inexpensive fixture. As a portable drill, "Airfeedrill" hangs by its nose to a jig for precision drilling.

See for yourself how quickly and inexpensively you can automate *your* drilling operations . . . see your Gardner-Denver representative or write for Bulletin 92-121.

GARDNER-DENVER Since 1859 100 1959 YEARS

EQUIPMENT TODAY FOR THE CHALLENGE OF TOMORROW

GARDNER - DENVER

Gardner-Denver Company, Quincy, Illinois

In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Avenue, Toronto 16, Ontario

CIRCLE INFORM-A-GRAM KEY NO. 67

Throw-Aways Cut Cost by 60%

Specially designed tooling with throw-away carbide inserts reduce tool cost to 40% of the former cost in rough turning a 5¼" radius on 10½" dia SAE 4140 forged steel trunnion sockets for front wheel axles. Additional savings result in an approximate 1½ hr reduction in

tool changing time per insert used.

Before adopting throw-away insert tooling, modified brazed tip tools were used. But interrupted cutting in steel caused frequent tip breakage so that an average of only seven pieces were machined at each of seven tool grinds for tool life of 56 pieces. Using positive-rake square throw-away Kendex inserts with four cutting edges, 10 pieces per indexable cutting edge can be machined for 40 pieces per insert.

Tool costs were reduced from 17 cents to 7 cents per piece because of longer tool life and the elimination of regrinding. Cost of the brazed tool, including modification of cutting edges, was $4 plus $5.60 for seven regrinds for a total cost of $9.60, or 17.1 cents per piece.

Throw-away insert tools are modified Kendex Style KSDN-64C toolholders with Grade K4H square inserts. Holders cost $12.65, which, prorated for 10 inserts, would be $1.26 per insert (before modification). Inserts at $1.45 each make the total tool cost $2.71, or 6.8 cents per piece. Since Kendex inserts can be indexed or replaced in seconds without disturbing the toolholder setting, each change of cutting edge saves 15 to 20 minutes.

Machining is done on a Gisholt turret lathe with feed of 0.020" ipr and 3/16" depth of cut, at 194 rpm, 510 to 218 sfm.

"Still the Best Performer"

3P PUNCHES DIE BUTTONS RETAINERS

GET THESE EXTRAS AT NO EXTRA COST

X Greater Economy X Immediate Delivery
X Complete Interchangeability

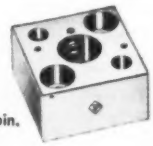
HEAD TYPE PUNCH
Made To ASTE
Standards with Forged Heads

PRESS FIT
DIE BUTTON
for heavy duty
usage

BAL-LOK PUNCH
Light & Heavy Duty

BAL-LOK
DIE BUTTON
Uniformly
Hardened

KWIK-PULL
RETAINER
End & Square.
Designed for easy
removal from
position on dowel pin.



HEAD TYPE
DIE BUTTON
For long wear-
life and heavy
duty usage.

Porter Precision Products grind their products to any decimal size, and at no extra cost. Immediate delivery from stock. Distributors in all principal cities. Order 3P quality products and enjoy substantial savings. Cut your inventory, your costs and down time, with 3P products made of Graph-Mo Tool Steel that gives extra long wear life. Write for 3P Catalogue No. 200.

PORTER PRECISION PRODUCTS
P.O.B. 208 CINCINNATI 15, OHIO

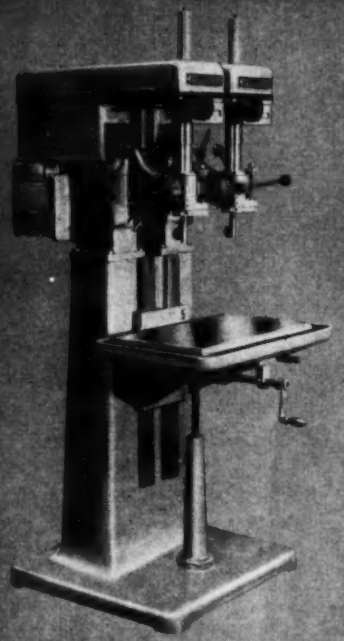
CIRCLE INFORM-A-GRAM KEY NO. 68

Barrel Finishing Cuts Clock Costs

Deburring and finishing of 80,000 cast gear wheels per day in an Almco barrel finishing installation is saving money for Westclox Division of General Time Corporation. The company processes 24 different parts in 10 Almco machines, resulting in a daily labor saving of $193.60. Under the old methods, using power tools, only 3500 clock parts could be finished during an 8-hr shift.

EDLUND

The Greatest Advance in Drilling and Tapping Machines in the Past 25 Years



Edlund Model 1F

Sensitive machine for small parts and components.

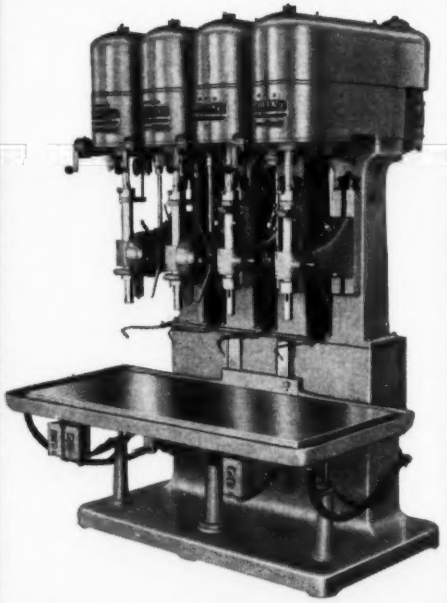
Infinite selection of speeds to 10,000 rpm

7" & 10" Overhang

⅜" Capacity

Pedestal and Bench models

Write for Bulletin 140R



Edlund Model 2F

A top production machine for medium to heavy drilling and tapping.

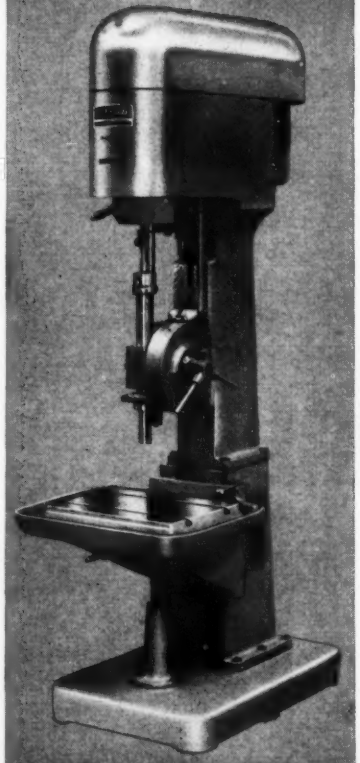
Infinite selection of speeds to 3,600 rpm
8"–12"–15" Overhang 1¼" Capacity

Pedestal and Round Column types

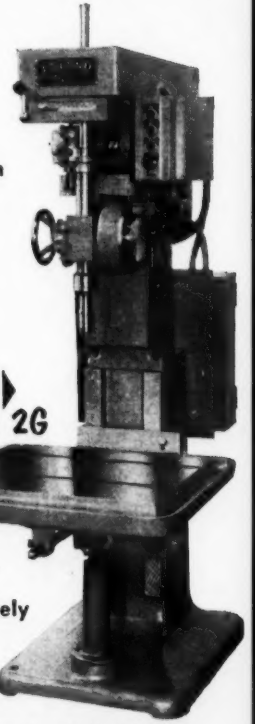
Write for Bulletin 140R

EDLUND REPRESENTATIVES IN MAJOR CITIES

CIRCLE INFORM-A-GRAM KEY NO. 69



Edlund Model 4F



A work-horse production machine for heavy duty drilling and tapping operations.

1¾" capacity with infinite selection of speeds to 2200 rpm

12" Overhang

Pedestal or Round Column Types

Write for Bulletin 170 R

NEW! Edlund Model 2G

Vertical Gun Drilling Machine

Deep hole drilling up to 7½" at production rates in one single operation producing extremely straight smooth holes with a finish from 4-8 micro-inches.

⅝" Capacity with spindle speeds to 8000 RPM 12" Overhang

Write for Bulletin 2G

Write for FREE Descriptive Bulletins

EDLUND

MACHINERY COMPANY

Cortland, New York

Division of Harsco Corporation

Book Reviews

APPRAISING EXECUTIVE PERFORMANCE, by Carl Heyel. Published by American Management Association, 1515 Broadway, New York 36, N. Y., 1958. 189 pages, $4.50, $3 to members.

The author shows how to set up realistic yardsticks for measuring an executive's performance and how to judge specific managerial skills, including technical knowledge and experience, decision-making ability, and ability to coordinate and direct other personnel. Ways of relating the executive's personal traits to his work are also examined. Systematic evaluation is stressed with practical examples drawn from actual company appraisal programs.

TECHNIQUES OF PLANT MAINTENANCE AND ENGINEERING — Volume X. Published by Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y., 1959. 266 pages, $10.

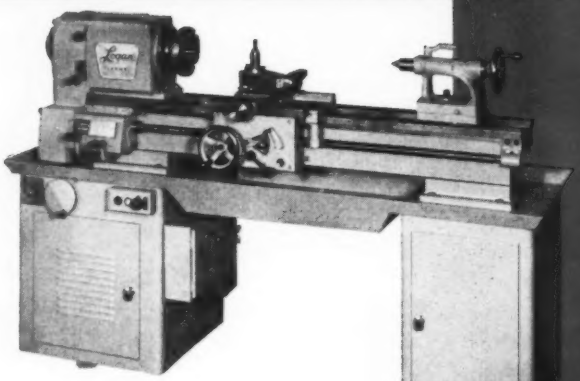
This is a round-up of papers delivered at the National Plant Maintenance and Engineering Conference, which covered a broad range of subjects from organization of the plant maintenance and engineering functions to maintenance of numerically controlled machine tools and in nuclear plants. Round table sessions and floor discussions from the conference are also included.

CREEP OF ENGINEERING MATERIALS, by Iain Finnie and William R. Heller. Published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y., 1959. 327 pages, $11.50.

The slow deformation of solid materials over extended periods under load presents a problem to the design engineer. Choice of materials and design of parts for creep conditions are discussed in this complete treatment of the subject. Testing, mechanisms, stress analysis, choice of a design stress, and other facets of creep behavior are covered. Specific applications are presented to aid in the solution of engineering problems.

its specifications add up to high production capacity

Logan 14" Lathe



Logan No. 6565 14" Lathe

Logan designs greater reliability and accuracy, and longer life into its lathes by a generous combination of high-capacity features. For instance—

- An oversize spindle with 1⅝" bore turns on four super-precision ball bearings with built-in preload
- A variable-speed drive lets you change speed while work is turning—without shifting belts
- A warp-free lathe bed with high, strong walls braced by oversize ribs to withstand heaviest stresses; two V-ways and two flat ways are flame-hardened and precision-ground.

There are many more reasons why this and other Logan Lathes have a greater capacity. The complete specifications tell the story. Write for them.

- Spindle speeds to 2000 rpm
- 1½" Levermatic collet chuck capacity
- 14⅝" swing over bed
- 9" swing over saddle cross slide
- 40" between centers

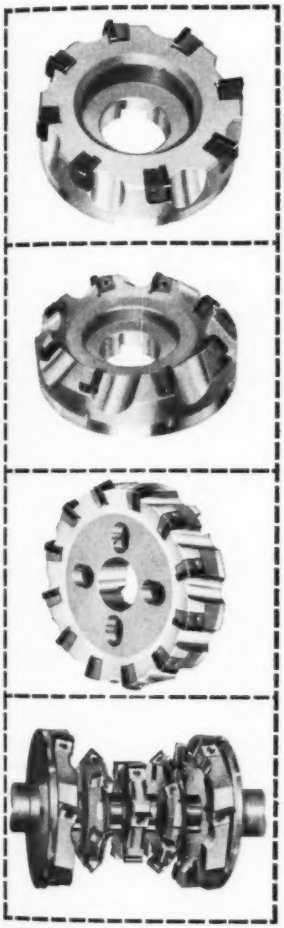
LOGAN ENGINEERING CO. Dept. M-1159, 4901 Lawrence Avenue, Chicago 30, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 70

THE INFORM-A-GRAM CARD FOLLOWING PAGE 114 IS FOR YOUR CONVENIENCE IN MAKING INQUIRIES.

More Milling Possible... Milling More Profitable with FUTURMILL

and a handful of carbide blades



Futurmill's indexable milling cutters converted so many *slow and expensive* machining methods to *fast, low cost* operations, that they established the value of "indexable tooling" . . . recognized as one of today's most important contributions to metalworking progress.

1. Lower cost metal removal

Futurmill takes the burden out of milling with inexpensive indexable carbide blades. No need to remove the cutter from the machine . . . no more cutter grinding and no more delays and lost production time. Index a Futurmill quickly and accurately, right on the machine. Eight times per blade with negative rake cutters and four times with positive. Futurmill's precision ground blades get the finest finish obtainable and more metal removed per cutting edge.

2. Plenty of muscle for any job

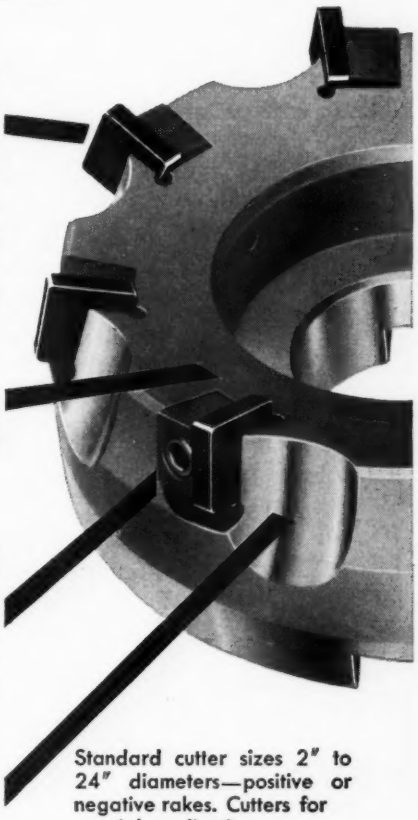
The cutter body is a solid one piece construction of heat treated alloy steel . . . not only the most rigid cutter built . . . but precision built.

3. Protection for the cutter body

The case hardened wedges behind the blades absorb the damage in case of an accident and save the cutter body . . . cutting down expense and lost production time for cutter repair or replacement . . . reducing inventory investment. With just a few extra wedges you're back in production.

4. Unobstructed chip clearance

Huge chip pockets in front of the blades direct the chips ***out and away*** from the cut—critical on steel applications and on deep cuts.



Standard cutter sizes 2″ to 24″ diameters—positive or negative rakes. Cutters for special applications.

FUTURMILL, INC.

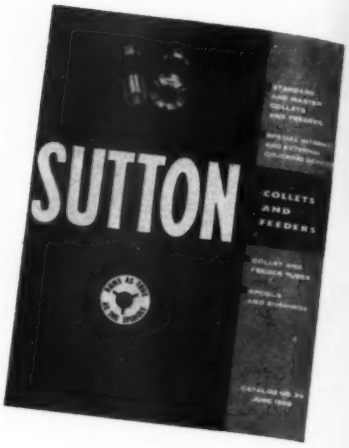
6360 Highland Road • Pontiac, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 71

Catalogs and other helpful literature

Rubber Bonded Abrasives for polishing and finishing are discussed in a bulletin that covers unfinished sticks and stones, special purpose stones, wheel dressers, and rubber bonded polishing wheels. The Carborundum Co. supplies copies, or Circle Inform-A-Gram No. C1.

"Titanium Metals Handbook for The Chemical Processor" outlines corrosion resistant properties of titanium metal and its design and fabrication characteristics. Get this 36-page handbook from Titanium Metals Corp. of America, or Circle Inform-A-Gram No. C2.



Sutton Collets and Feeders for use on automatic screw machines, turret lathes, engine lathes, milling machines, and grinders are featured in a 24-page catalog. Get Catalog 23 from Sutton Tool Co., or Circle No. C3.

Die Stamped Letters, numbers, and arrows on pressure sensitive adhesive, for do-it-yourself sign-making, are outlined in a bulletin. Dimensions, uses, and ordering data are given. Write Earl Houska Signs, or Circle Inform-A-Gram No. C4.

C-Clamps, specially hardened by Wilton's white-hot Fire Bath process, are presented with dimensions in a bulletin. Get Catalog 707 from Wilton Tool Mfg. Co., Inc., or Circle Inform-A-Gram No. C5.

Good Machinability and high resistance to wear and corrosion are advantages of the new extruded manganese-bronze alloy used for high production jobs. Bulletin G53 is supplied by Ampco Metal, Inc., or Circle No. C6.

Jig & Fixture Components and step blocks and clamps are detailed in a catalog. Applications and complete specifications are given. Ask for Catalog 29 from Northwestern Tools, Inc., or Circle No. C7.

For Filing, sawing, or lapping use the Keller die filer, announced in a bulletin. Dimensions of different models are given and types of saws and abrasives are included. Get Bulletin 256 from Sales Service Mfg. Co., or Circle No. C8.

Precision Finishing with the Vibratron precision finishing machine is introduced in a bulletin. Design features and case histories are highlighted. Get catalog from Roto-Finish Co., or Circle No. C9.

DEBURRING COSTS CUT 2/3 ON THIS PART!

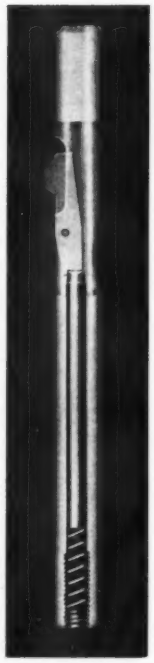
Spring-loaded Burraway blade chamfers top edges on down-stroke, depresses to pass through stock.
On up-stroke, Burraway blade chamfers under edges. Four edges in just one pass!

One pass of the Cogsdill Burraway tool chamfers four hole edges on this stamped handle. The job previously required four separate passes—two with a right-angle chamfer, two with a standard tool.

Burraway's spring-loaded blade adjusts for light deburring or up to ⅛" chamfer. On down-stroke, just enough pressure exerts to catch the edge; the blade then depresses to pass through the stock. On up-stroke, the under-edge is similarly chamfered.

Burraway works in any head, on automatics or multiple-spindle machines to eliminate many hand or secondary operations. Its costs are often returned the first day. If you debur or chamfer, you need Burraway.

FOR THE ASKING—Complete Cogsdill catalog on Burraway, Baksink, Bearingizing and other time-saving tooling.



Cogsdill
TOOL PRODUCTS, INC.
12978 W. EIGHT MILE RD., OAK PARK 37, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 72

IF IT ISN'T MADE BY BELLOWS . . .

it isn't a HYDRO-CHECK*

*TM Registered U.S. Patent Office. No. 527,974

Hydraulic checking of the movement of an air cylinder piston rod smooths out the natural "bounce" or "springiness" of air—gives to air power perfect smoothness, complete freedom from chattering.

Hydraulic checking of air cylinder power has become standard in practically any pneumatic operation involving precision control.

Our registered trade mark for such hydraulic checking devices is "HYDRO-CHECK." The Bellows Hydro-Check has become so popular and is used so widely for precision control of pneumatic or even manual power, that many imitators have appeared on the market—but there is only one HYDRO-CHECK and it is manufactured by The Bellows Co. *If it isn't made by Bellows it isn't a Hydro-Check.*

OTHER REGISTERED TRADE MARKS OF THE BELLOWS CO.

THE BELLOWS AIR MOTOR — the air cylinder with the built-in valve and operating controls.

THE SUPER-SPEED AIR MOTOR — the air cylinder with twice the speed — twice the power.

ELECTROAIRE — the electrically controlled four-way valve for integral mounting on the Bellows Air Motor or for remote control of any air cylinder of suitable capacity.

PULSA-PAK — an electrical control device to permit maintained circuits yet provide a momentary electrical impulse.

SENSITORQUE — a torque-sensing unit for control of deep hole drilling operations.

CARBI-DRILL — heavy-duty drill unit.

LUBRI-AIR — a unit to filter, pressure regulate and lubricate compressed air.

POWER-DOME — plain air cylinders featuring dome head construction.

1493-B

Would you like to know more about the many models and sizes of Bellows Hydro-Checks? What they are — how they work — how you can use it to obtain precision control of air cylinder movement? Write today for Bulletin HC-600R. Address Dept. TP-1159, The Bellows Co., Akron 9, Ohio.

The Bellows Co.

DIVISION OF INTERNATIONAL BASIC ECONOMY CORPORATION (IBEC)

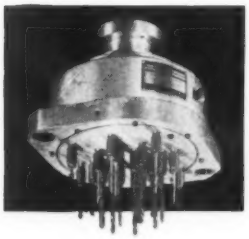
AKRON 9, OHIO

OTHER INDUSTRIAL DIVISIONS OF IBEC: Sinclair-Collins Valve Co., Valvair, Akron, Ohio • V. D. Anderson Co., Cleveland, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 73

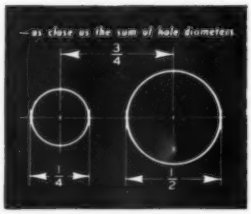
ZAGAR HEADS for Drilling · Reaming · Tapping

FOR ANY NUMBER OF HOLES, IN ANY MATERIAL, IN ANY PATTERN, ON ALL CENTERS



FIXED CENTER HEADS

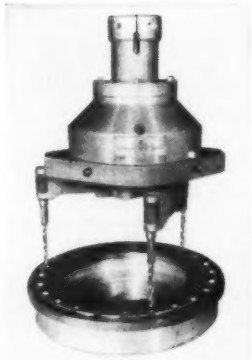
Up to 1500 holes can be drilled simultaneously by Zagar heads. In addition, Zagar can design "salvageability" into fixed center heads to give flexibility and changeability. Get Engineering Sheets 66-68-A.



ADJUSTABLE SPINDLE HEADS feature:

no universal joints
no bulky gear clusters
no flexible shafts

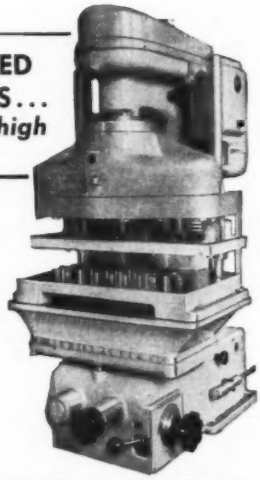
Gearless drill head principles are incorporated in Zagar's exclusive adjustable spindle head. Adaptable on any standard drill press. Great flexibility within a bolt circle diameter of 23". Reworkability extends the life of Zagar heads to cover limitless jobs of varying hold patterns. Write for Bulletin 458.



COMPLETE, TOOLED "PACKAGE" UNITS... *for economical, high production.*

More holes at less cost per hole simply states the Zagar goal. Whether it is through special machinery, "packaged drilling", or one of many heads, Zagar engineers strive to increase your hole production at reduced cost. Illustrated are basic Zagar lines. From these emanate hundreds of individual solutions to meet the challenge — more profit at lower cost. From these hundreds of Zagar heads have been drilled millions of holes at costs of literally pennies per part. Send us your parts or drawings for a study of hole cost reduction.

Write for Engineering Manual "T-11."



Drill head mounted on air-oil press, completely self-contained — all by Zagar.

Zagar INCORPORATED
23894 LAKELAND BLVD.
CLEVELAND 23, OHIO
TOOLS FOR INDUSTRY and SPECIAL MACHINERY

CIRCLE INFORM-A-GRAM KEY NO. 74

Catalogs..

"Perforating Punches" is a 24-page catalog that gives specifications for heavy duty and high speed perforators and quills. Engineering data and stamping pressure chart are included. Durable Punch & Die Co., supplies copies, or Circle No. C10.

Roll Lathes which can be arranged for either hydraulic or electric contouring are presented in a new bulletin that describes features and lists specifications. Farrel-Birmingham Co., Inc. supplies Bulletin 121, or Circle No. C11.

Cutting Speeds and Feeds for 19 metals and non-metallic materials are listed in a table in a 12-page catalog of a new line of solid carbide end mills. It covers 15 different styles of fluted end mills. Get Catalog 559 from Kennametal Inc., or Circle No. C12.

Midget Mills with 1/4" shanks for faster finishing are outlined in a bulletin that includes diagrams and dimensions. Write Severance Tool Industries Inc. for a copy, or Circle Inform-A-Gram No. C13.

"Wrought Aluminum Tooling Plate Type 33" gives properties, specifications and explains features for applications where maximum stability, flatness, workability, and ease of handling are required. Write for a copy to Reynolds Metals Co., or Circle Inform-A-Gram No. C14.

Stock and Wire Straighteners, available in a wide range of sizes, are explained in a bulletin. Applications are included in this bulletin, available from Durant Tool Co., or Circle Inform-A-Gram No. C15.

For the deepest draws on the toughest metals

Johnson's 700 WAX-DRAW does every draw in the shop. *Easy to apply* by roller coating, spraying, dipping, etc. Use wet or dry. Blanks can be fed directly into the press or may be pre-coated, dried and palletized. *Easy to remove,* using solvent bath, vapor degreaser, alkaline washer or even hot water alone. *Money saving.* One gallon undiluted covers 2,000 square feet. Four-to-one dilutions produce excellent results. 700 Wax Draw handles multiple draws with only one application even at pressures to 200,000 p.s.i. and temperatures to 450°F.

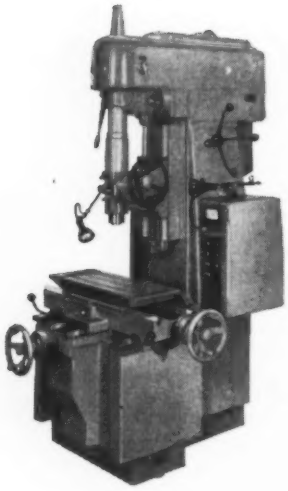
For further information write: JOHNSON'S WAX Racine, Wisconsin, Dept. TP-11

Another great metalworking product from Johnson's Wax Service Products Division

CIRCLE INFORM-A-GRAM KEY NO. 75

Accuracy to the split-tenths

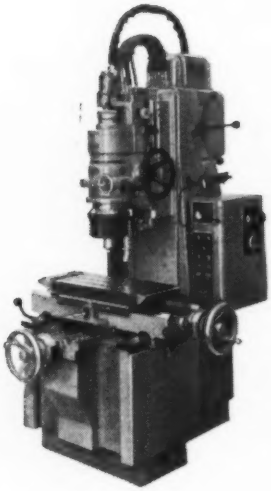
FLASH! All Moore machines shipped after February 15, 1959 are made and calibrated to the New International Inch.



LOCATES AND BORES HOLES TO LESS THAN A "TENTH"

No. 3 Moore Jig Borer

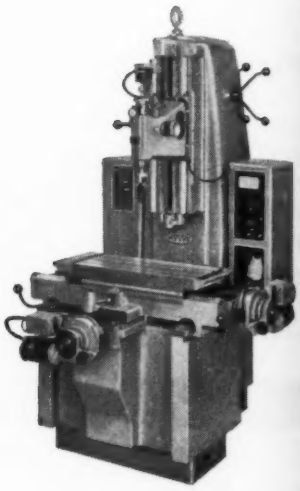
For boring, drilling, reaming and spotting holes in dies, jigs and production parts, the speed and accuracy of the Moore Jig Borer has never been equaled. Now, with this new and larger No. 3 model, you will break the "tenth" barrier! Here's why: it offers more precise positioning tolerances...all hardened, ground and lapped ways...no gibs...no overhang...improved drive...wider speed range 60 to 2250 RPM...larger table working surface, 11" x 24"...micro setting of vernier dial...more accessible cross-clamping. These new features, plus sensitive, centralized controls for spindle speeds and feeds, quick tool-changing, easy lubrication add up to a Jig Borer which belongs in every toolroom where *tomorrow's* accuracies must be achieved *today!*



LOCATES AND GRINDS HOLES TO LESS THAN A "TENTH"

No. 3 Moore Jig Grinder

The originators of jig grinding and the Jig Grinder have done it again! Now, with this new, larger No. 3 model, you can grind—*with split-tenth accuracy*—holes plus regular and irregular contours to size and location after hardening. This is made possible by the closer locational tolerances built into the machine...by the all-hardened-ground-and-lapped ways...by the faster strokes provided for chop-grinding...by the infinite spindle speeds, 40 to 250 RPM...by the larger table working surface, 11" x 24". The same quickly set precision lead screws as in the Moore Jig Borer simplify the finish-grinding process.



MEASURES TO ONE-THIRD OF A "TENTH"

Moore Universal Measuring Machine

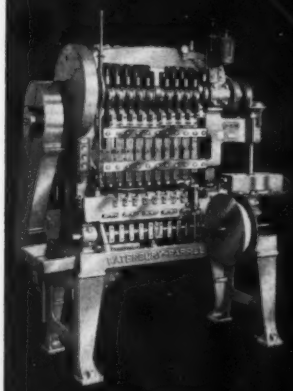
This machine, built on the same basic principles as the No. 3 Moore Jig Borer and No. 3 Moore Jig Grinder, introduces a new concept in ultra-precise measurement and inspection. It offers *for the first time:* A machine combining the capacity for larger work-pieces; choice of electronic indicator supported on an accurate, rotatable spindle, or a universal microscope for pickup; a combination of rectilinear and angular positioning, making possible the measurement of the most complex contours. Design and construction insure the highest possible accuracy. All ways are hardened, ground and lapped steel, fitted to hand-scraped cast iron. Table positioning in two directions of travel is by means of master lead screws. Note motorized lead screw drive—it's optional (for Measuring Machine only).

ADD MOORE TOOLS TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTOGRAPH WHEEL DRESSERS • PRECISION ROTARY TABLES • HOLE LOCATION ACCESSORIES

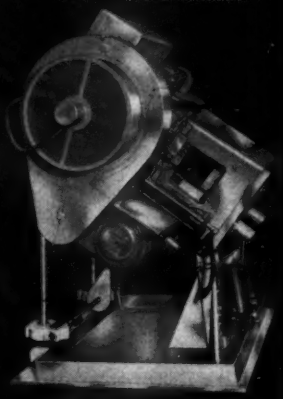
CIRCLE INFORM-A-GRAM KEY NO. 76

COLD HEADING MACHINERY

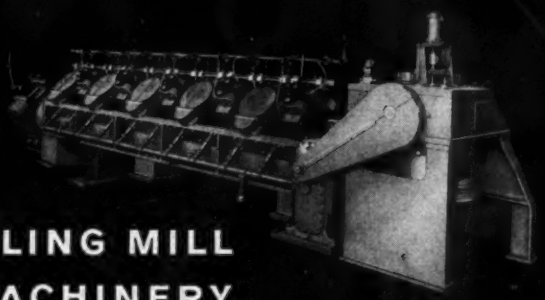


WATERBURY FARREL
MACHINERY BUILDERS

POWER PRESSES



EYELET, SLITTER & WIRE MACHINERY



ROLLING MILL MACHINERY

THE WATERBURY FARREL FOUNDRY & MACHINE CO.
DIVISION OF TEXTRON INC.
Waterbury, Connecticut • U.S.A.
Sales Offices: Chicago • Cleveland • Los Angeles • Millburn, N. J.

WF-55

CIRCLE INFORM-A-GRAM KEY NO. 77

SPEED-BAND®
the newest concept in band saw blades—made from L-100-M, a double carbide alloy developed *especially* for band saws. Its hot hardness and abrasion resistance effect extraordinary results.

Available only from Capewell Distributors, of course

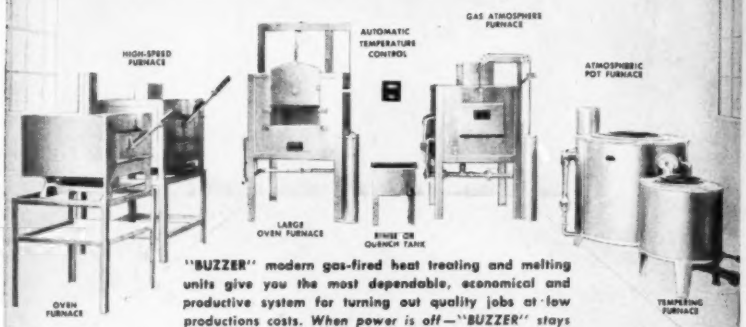
INDUSTRIAL DISTRIBUTORS
SERVING INDUSTRY ECONOMICALLY
THE RIGHT HAND OF PRODUCTION

CAPEWELL

THE CAPEWELL MFG. CO.
HARTFORD 2, CONN.

CIRCLE INFORM-A-GRAM KEY NO. 781

MORE HEAT TREATING VOLUME
with BASIC "BUZZER PACKAGE"
NO BLOWER OR OTHER POWER NEEDED
. . . just connect to gas supply



"BUZZER" modern gas-fired heat treating and melting units give you the most dependable, economical and productive system for turning out quality jobs at low productions costs. *When power is off—"BUZZER" stays on the job!* Standard and special furnaces, large or small, available to equip your shop to exact requirements.

COMPLETE LINE OF BUZZER REG. U.S. PAT. OFFICE BURNERS FOR CLEANING, RINSING, PICKLING AND SUNDRY HEAT OPERATIONS

WRITE TODAY FOR NEW "BUZZER" CATALOG

CHARLES A. HONES, INC.
HEAT TREATING EQUIPMENT SPECIALISTS SINCE 1911
153 S. Grand Avenue, Baldwin, L. I., N. Y. • BAldwin 3-1110

CIRCLE INFORM-A-GRAM KEY NO. 782

WILTON

Isn't it nice to know that when you buy Wilton Vises:

1/ They'll never need oiling!
(Thanks to Wilton's lifetime lubrication)

2/ They're the most rugged!
(Even have more pounds of malleable iron than most ordinary vises of grey iron)

3/ They deliver greatest locking force!
(Fine machining is the secret)

To get the most vise value for every dollar always specify WILTON . . . because *the best costs no more!*

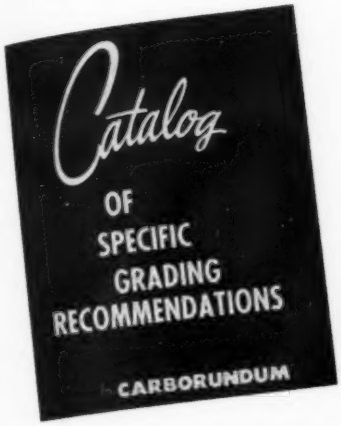
FOR FREE CATALOG ATTACH THIS AD TO YOUR LETTERHEAD AND MAIL TODAY!

WILTON TOOL MANUFACTURING CO., INC. / 9525 Irving Park Road / Schiller Park, Illinois
CANADIAN ADDRESS: 178 NORSEMAN ST., TORONTO, ONTARIO

TP-119

CIRCLE INFORM-A-GRAM KEY NO. 783

Catalogs . .



Over 1600 Experience-Tested Abrasive Wheel Recommendations for grinding everything from Agate to Zirconium are set up in alphabetical order in a 57-page catalog. Material, work, operation, with respective recommendations on abrasive, grit, grade, and bond, are listed. Get this catalog from The Carborundum Co., or Circle Inform-A-Gram No. C16.

Contract Machine Work facilities are discussed and illustrated in a bulletin. Bulletin 59 from Standard Tool & Mfg. Co., gives details, or Circle Inform-A-Gram No. C17.

Plastic Extruded Shapes and fabricated parts are described in a bulletin that outlines advantages, uses, and limitations of three plastic materials. Get a copy from National Vulcanized Fibre Co., or Circle Inform-A-Gram No. C18.

New OBI Mechanical Gap Presses are discussed in a bulletin. Construction and operating advantages of the 75- to 200-ton Series are explained. Bulletin M-1000 is available from The Oliver Corp., A. B. Farquhar Div'n, or Circle Inform-A-Gram No. C19.

A Hydraulic Tracer for milling machines, to handle rise and fall duplicating, is outlined in a bulletin which gives dimensional diagrams and special features of the Mimik Model 4000. For your copy, write Retor Developments Ltd., or Circle Inform-A-Gram No. C20.

Adjustable Flanged Toolholders for popular makes of turret lathes are offered in a bulletin. Advantages, diagrams, and dimensions are given. The Gahr Machine Co., or Circle Inform-A-Gram No. C21.

CIRCLE INFORM-A-GRAM KEY NO. 79

ANNOUNCING

EXTRUDED RECTANGLES of AMPCO® METAL

Now available from stock

Save money on wear strips, guides, wear plates, and similar applications — specify Ampco Metal Extruded Rectangles. 69 sizes, ¼" x 1" to 2" x 4" — mill lengths or cut to your requirements. Two grades, Ampco Metal Grades 18 and 21.

Write for bulletin and name of your Ampco distributor.

D-74

AMPCO® *THE METAL WITHOUT AN EQUAL*

AMPCO METAL

AMPCO METAL, INC.
Dept. 54K, Milwaukee 46, Wis.
West Coast plant: Burbank, California
Southwest plant: Garland (Dallas County), Texas

CIRCLE INFORM-A-GRAM KEY NO. 80

Catalogs . .

New Machine Mounts, designed for vibration control and shock protection, are highlighted in a bulletin. Design sketches and application tables are included. Consolidated Kinetics Corp., supplies copies, or Circle Inform-A-Gram No. C22.

"Replacement Analysis Manual" explains the replacement pros and cons and terms used in the replacement analysis, and includes a form to help appraise your machinery replacement situation. Write The Heald Machine Co., or Circle Inform-A-Gram No. C23.

"Some More Good Things to Know About Metal Cleaning" discusses the chemistry and techniques of cleaning, electrocleaning, machine cleaning, and ultrasonic cleaning. Get a 28-page handbook from Oakite Products, Inc., or Circle Inform-A-Gram No. C24.

A General Commercial Tube Selector Chart is included in a copper and brass bulletin, which gives advantages and applications. Get your copy from Scovill Mfg. Co., or Circle Inform-A-Gram No. C25.

Pneumatic Tools for heavy-duty metal and plastic finishing work are detailed in a bulletin which explains the new Series 2. For Bulletin 102, write Doeden Tool Corp., or Circle Inform-A-Gram No. C26.

Shock and Vibration Control Data is given for machinery and isolation mounts and test equipment. Get Bulletin 59-05 from Barry Controls Inc., or Circle Inform-A-Gram No. C27.

Adjustable, Chatterless Countersinks bulletin describes and illustrates a new type of adjustable countersink. Advantages, features, and dimensions are included. Madison-Relco Tool Co., or Circle Inform-A-Gram No. C28.

Cold Processed Aluminum Rod and Screw Machine Stock is discussed in a bulletin which shows advantages, applications, properties, and finishes. Get your copy from Olin Mathieson Chemical Corp., or Circle Inform-A-Gram No. C29.

Safety Pliers that won't damage expensive forming dies if accidently dropped into a moving press (because they flatten so press completes the stroke) are pictured in Bulletin 1056 from Osborn Mfg. Corp., or Circle Inform-A-Gram No. C30.

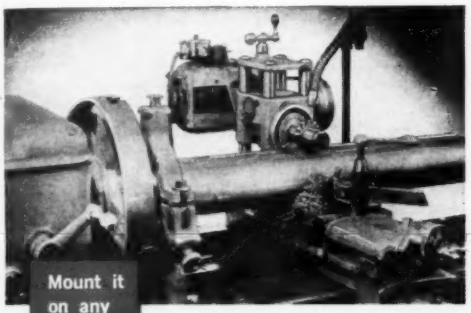
get portable, precision machining anywhere

AT LOWER COST

WITH DUMORE VERSA-MIL®

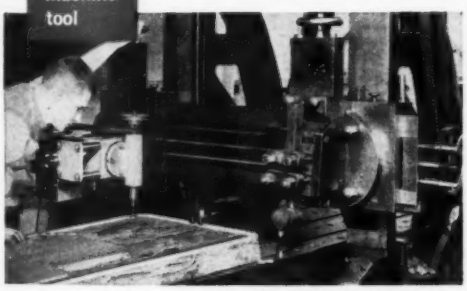
only $625, No. 2 Unit, FOB Racine

MILLS • BORES • SHAPES
SLOTS • GRINDS • DRILLS

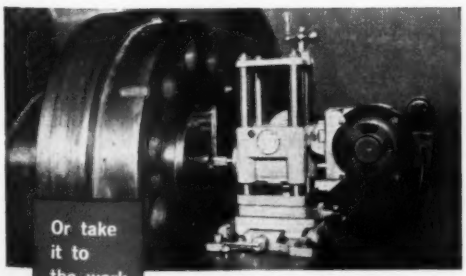


Mount it on any machine tool

Cutting keyway after turning on lathe



Drilling after shaping casting on shaper



Or take it to the work

Milling Huge steel forging in place

Compact, rigid, portable. Performs in any position. Built-in power and feeds. Use independently or attach to machine tools for secondary operations. Saves handling, moving, set-up and down-time. Also used for machining in-place parts too big for standard machines. Provides close tolerance quality at *profitable* metal removal rates. Gives you the *advantage* of machining where it is most economical!

Ask your local DUMORE Industrial Supply Distributor

for a demonstration . . . at his place or in your shop. Ask him, too, about the many accessories for broader, lower cost machining operations in maintenance, job shop, tool room or production applications. One unit often pays for itself on one job!

You Can Do More with DUMORE®

All-Purpose Precision Metalworking Tools

THE DUMORE COMPANY • 1304 Seventeenth St., Racine, Wisc.

Versa Mil • Drill-N-Tap Units • Drilling Units • Drill Heads
Micro-Drills • Drill Grinders • Precision Grinders
Hand Grinders • Flex-Shaft Tools • Quills and Accessories

Want more details? -- **SEND COUPON**

THE DUMORE COMPANY • 1304 Seventeenth St., Racine, Wisc.

Send me Versa-Mil details ☐

Name_____
Company_____
Address_____
City_____ Zone____ State_____

CIRCLE INFORM-A-GRAM KEY NO. 81

Sharpen Your Metal Saws Automatically - At Small Cost

Wardwell's "57 T" will sharpen as many as 250 Milling Cutters, Slitting and Screw Slitting Saws .015" thick at one time with an accuracy plus or minus .001" of exact diameter entire lot.

"57 T" automatically indexes the gang of saws, one row of teeth at a time. Also will grind either wet or dry.

Why not start **now** to enjoy the **cash** savings "57 T" will bring you. Please write for catalog sheet.

WARDWELL
Manufacturing Company
3809 Ridge Road
Cleveland 9, Ohio

Makers of Largest Line of Saw and Tool Sharpening Machines

CIRCLE INFORM-A-GRAM KEY NO. 821

Rodgers Presses

PRECISION HYDRAULIC POWER

FOR METAL FORMING and DRAWING

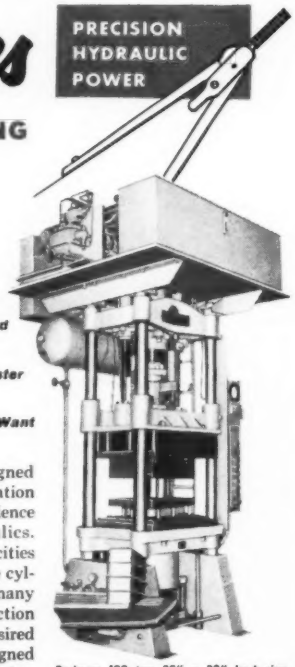
From Rodgers "Standard" Line Select your "Custom" Model

Easy as A B C:

A — *Determine Press Tonnage and Style Press You Need*

B — *Bed and Frame Size Required... Solid or Open Bolster*

C — *Select Pump Unit and Controls To Give Speed You Want*



Rodgers 100 ton 30" x 30" bed size with complete one cycle automatic control for deep drawing.

The New Standard line of Rodgers Platen Presses has been designed to greatly simplify press selection. From the basic press styles, one may be selected and combined with varied pumps and controls, automatic, semi-automatic or pressure sensitive, to give the desired speed and performance. This results in savings of "custom" engineering and costs.

Rodgers Presses are designed and built by an organization with over 32 years' experience in high pressure hydraulics. They are available in capacities from 50 to 400 tons, single cylinder or twin cylinders, in many standard models for production or special uses. Where desired custom models will be designed to suit exacting special requirements.

SEND FOR *NEW* CATALOG 337...

This new Rodgers Catalog has complete specifications, tables and data, making it simple to determine the press for the job. Write for your copy without obligation.

Rodgers twin cylinder, twin die cushion 200 ton drawing press with 60" x 48" bed, single cycle automatic.

Rodgers 100 ton press, 36" x 36" bed with single lever pressure sensitive manual control.

RODGERS HYDRAULIC, Inc.
Pioneers In High Pressure Hydraulics Since 1932
7447 WALKER STREET · MINNEAPOLIS 26, MINNESOTA

CIRCLE INFORM-A-GRAM KEY NO. 822

CONTRACT SERVICES DIRECTORY

Listings, $12.00 per inch ($1.50 per ¼ inch) Minimum charge, $4.50 per insertion. Rates net.

Illinois

DRESEL-BETZ CO.
Belleville, Ill.
Designers and Manufacturers of Tools, Dies, Jigs, Fixtures, Metal Stampings

Michigan

DAVIS TOOL and ENGINEERING CO.
19250 Plymouth Road, Detroit, Michigan. VErmont 5-6000. Tools and Dies. Special Machinery, Sheet Metal Stampings and Assemblies.

New Jersey

TEMJAY TOOL & MACHINE CO.
236 South Street, Newark, N. J.
MI 3-0891 — RE 1-7860
Designers & Builders
Tools, Dies, Jigs, Fixtures, Molds and Special Machines

Ohio

BUCKEYE INCUBATOR CO.
329 Mt. Vernon Ave., Springfield, Ohio
FA 5-9222—Ext. 263
Production Facilities for Metal Stampings, also Woodworking, Machining, Welding, Painting and Assembly. Tooling & Production at Reasonable Prices.
Large or Small Parts
Long or Short Runs.

CLEVELAND UNIVERSAL JIG COMPANY
13404 St. Clair Ave. Cleveland, Ohio
MU 1-2600
DESIGNERS AND BUILDERS
Jigs and Fixtures Special Machines
Production Engineering
Complete Plant Routing and Tooling

Wire Forms: Racks, Wire Assemblies:
Made to Specifications
LOW PRICES: WRITE
Fasform Wire Division
6125 Carnegie Ave., Cleveland 3, Ohio

GENERAL DIE & TOOL CO.
2067 W. 55th St., Cleveland, Ohio
WO 1-4736
Dies, Tools, Jigs, Fixtures, Light Stampings, Special Machinery Manufacturing.

THE INDUSTRIAL MACHINE CO.
1436 East 47th St., Cleveland, Ohio
Founded in 1908. Builders of Special Machinery. General Machine Work.

KIFFER TOOL & DIE CO.
5601 Tillman Avenue, Cleveland, Ohio, WOodbine 1-2440 & 1-2441. Manufacturers of Special Machinery, Tools, Dies, Jigs, Fixtures, Swiss Jig Boring

NOBLE & STANTON, INC.
998 Broadway, Bedford, Ohio, BEdford 2-2800. Tooling, Short Run Production and Machined Parts for Automation.

Catalogs . .

A 36-Page Engineering Manual on multiple thread milling cutters and fine pitch gear hobs describes the processes, advantages, uses, sharpening, recommended feeds and speeds, and thread generating. Get your copy from The Hanson-Whitney Co., or Circle Inform-A-Gram No. C31.

The New Vibratron precision finishing machine is described in a brochure that diagrams the action of this machine and gives design features and operational data. Get copy from Roto-Finish Co., or Circle No. C32.

Boost Production Efficiency, lower downtime costs, reduce record-keeping, speed supervisory action, and cut inventory costs using Telecontrol, the production monitoring system described in Brochure H-201 from Telecontrol Div'n, Hancock Industries, Inc., or Circle Inform-A-Gram No. C33.

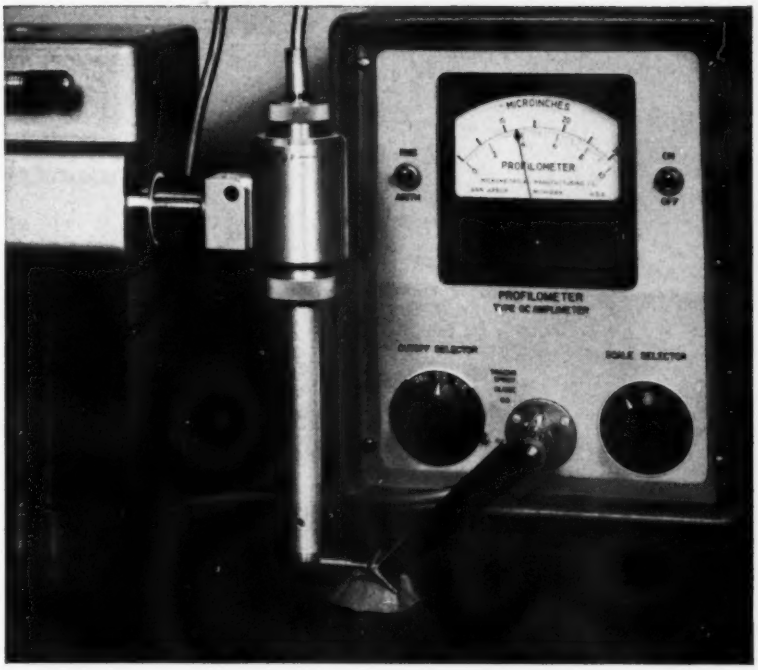
"Cylindrical Grinding Wheels" describes the abrasives and bonds used for various cylindrical cutting operations. Recommendations for cutting a wide range of metals are included. For a copy, write Macklin Co., or Circle No. C34.

Determine Circular Milling Cutter Performance using the new nomograph that shows cutting standards for circular milling cutters when applied to various metals and plastics. Get your chart from Morse Twist Drill & Machine Co., or Circle Inform-A-Gram No. C35.

Price Reductions on Carmet tools, blanks, and indexable inserts are listed in a 32-page catalog. For Catalog C-16-B write Allegheny Ludlum Steel Corp., or Circle Inform-A-Gram No. C36.

For Heat or Corrosion Problems use metal RA309, introduced in a new bulletin. Composition, density, and mean coefficient of expansion are listed in chart form. Ask for Bulletin 109 from Rolled Alloys, Inc., or Circle Inform-A-Gram No. C37.

New Drill Point Grinder bulletin contains specifications, production rates, and prices for the new Morse machine, capable of grinding any type of drill point at high speeds and to close tolerances. Morse Twist Drill & Machine supplies bulletin, or Circle Inform-A-Gram No. C38.



PERTINENT QUESTION:

WHY do you need the Profilometer®?

FACTUAL ANSWER:

To check practically *all* surfaces against microinch roughness specs —and to help cut production costs in 7 different ways.

FREE BULLETIN LT14 gives details on the Profilometer and its practical applications. May we send you a copy?

MICROMETRICAL MMC® MANUFACTURING COMPANY
345 S. MAIN ST. ANN ARBOR 6, MICHIGAN

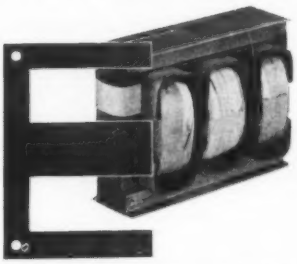
Manufacturer of the PROFILOMETER®, PROFICORDER®, MICROCORDER, WAVOMETER®, ANDEROMETER®, VAROMETER, CHART VIEWER • Exclusive American Sales Agent for CENSOR Dimensional Gaging and Sorting Equipment

CIRCLE INFORM-A-GRAM KEY NO. 83

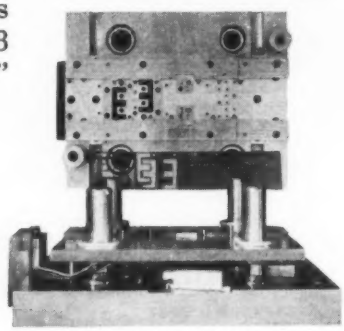
Cleveland Tool and Die
CASE FILE

"12 to 15 times longer die life"

CTD PRECISION CARBIDE DIES SPEED OUTPUT OF "FRANCEFORMER" LAMINATIONS



Check the transformer on the next neon sign you see, and chances are it'll read "Franceformer"—trade mark of the France Mfg. Co. of Cleveland, O. This aggressive company supplies leading jobbers of neon signs throughout the country. For high-speed lamination production, France chooses CTD precision tungsten carbide dies. "CTD dies give us continuous production with far less downtime", says Emil Olds, plant manager. "We get 12 to 15 times the die life at only 3 times the previous cost."



Another example of the important production efficiency made possible by CTD precision craftsmanship

Cleveland Tool and Die *means precision...*

Dies, Jigs, Fixtures and Special Purpose Tooling

Send for brochure describing CTD's plant and facilities. **FREE!**

Cleveland Tool and Die Co.
30510 Lakeland • Willowick, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 84

Catalogs . .

Over 1000 Standard Sizes of precision ground steels are listed in a 14-page catalog that gives dimensions on oil and air hardening, low carbon, precision ground tool steels. Write Peninsular Steel Co., for your copy, or Circle No. C39.

"Ultrasonic Cleaning Primer" tells what ultrasonic cleaning is, how it works, where it can be used, and what equipment is used. National Ultrasonic Corp., distributes copies, or Circle Inform-A-Gram No. C40.

A New Drill Head Series is presented in a bulletin which describes these adjustable multi-spindle drill heads that will drill, tap, ream, countersink, and counterbore almost any pattern. Get Bulletin 7698 from Cleveland Pneumatic Industries, or Circle Inform-A-Gram No. C41.

For Fast, Low-Cost Production Sawing use the heavy-duty band saw described in a bulletin. Advantages, construction features, and dimensions are included. The Henry J. Thompson & Son Co., or Circle Inform-A-Gram No. C42.

Assembly and Run-In Lubrication problems and their solutions are discussed in a bulletin. Drawings and photographs illustrate them. Acheson Colloids Co., or Circle Inform-A-Gram No. C43.

A New Universal Internal Grinding Machine bulletin discusses the new model's features and advantages. Specifications are listed. Write The Heald Machine Co. for Bulletin 2-273A-1, or Circle No. C44.

Types and Uses of Trico Electrical and lubricating devices are offered in a bulletin. Specifications for automatic and chain oilers, mist systems, and industrial fuses are included. Get Condensed Catalog 59 from Trico Fuse Mfg. Co., or Circle Inform-A-Gram No. C45.

Cut Grinding Costs with the wheel dressers described in a bulletin. Dimensions for the three "Economy" disc type dressers are given. Get copy from Precision Diamond Tool Co., or Circle No. C46.

A New Die Cushion Catalog describes pneumatic, hydro-pneumatic, and hydraulic types. Size and capacity data and typical die cushion arrangements are given. Get Catalog DC-59 from Verson Allsteel Press Co., or Circle Inform-A-Gram No. C47.

what is good BLADE LIFE?

It could be minutes . . . where a high surface feed rate is calculated to remove a lot of metal, fast.

Or, it could be hours . . . where a slower sfm rate means a smaller pile of chips, but lengthened blade life.

The point is, every job has a different set of variables that affect performance characteristics and costs. And an essential part of our product is a study of these variables to help you develop the lowest cutter costs consistent with improved performance. We consider your machine, work piece, feed rate, depth of cut, speed and finish requirements. Only after this information is pooled with your own knowledge of the application—costs and performance of present equipment—is any cutter or grinding technique recommended.

We would welcome the opportunity to tell you more about this unique cutter selection service. Write:

CIRCLE INFORM-A-GRAM KEY NO. 85

This helpful new booklet tells you how to reduce the cost of chips and improve your milling and boring performance. Ask for a free copy of booklet No. 68H.

THE
INGERSOLL
MILLING MACHINE COMPANY
CUTTER DIVISION
505 FULTON AVENUE • ROCKFORD, ILLINOIS

10-DAY TRIAL OFFER!

10-day examination allowed; returnable for full credit or refund if returned in saleable condition.

HUEBNER PUBLICATIONS, INC.
1975 LEE ROAD, DEPT. E
CLEVELAND 18, OHIO

Gentlemen: Please send books checked.

☐ **ADHESIVE BONDING OF METALS** by George Epstein. 1954; 227 pages. Types and strengths of adhesives, joint factors, etc. **$2.95**

☐ **BRAZING MANUAL** prepared by the Committee on Brazing and Soldering, American Welding Society. 1955; 208 pages. Practical information on every type of brazing problem, including tables. **$4.75**

☐ **COLD FORMING OF STAINLESS STEELS** by Lester F. Spencer. A 28-page pamphlet on the subject. **$1.00**

☐ **DIE DESIGNING AND ESTIMATING**

Fourth Edition

368 pages, 26 chapters, over 400 illustrations, charts and graphs. 165 Practical Points in Die Design and Construction. Comprehensively indexed.

Written for Die Designers, Die Engineers, Tool and Die Makers, Owners and Managers of Tool and Die Shops and Depts., Students, Apprentices and valuable, too, as a reference and refresher for the die experts who are more than qualified to write a comparable text. **$7.50**

☐ **DIAMOND TECHNOLOGY** by Paul Grodzinski. 784 pages. 93 working tables, and over 486 photographs and drawings. The only standard work on the subject. **$10.00**

☐ **DIE ESTIMATING** fourth edition. Provides the KNOW-HOW for determining what it takes in units of time to build a die. 62 pages. **$3.00**

☐ **ELECTROPLATING ENGINEERING HANDBOOK** edited by A. Kenneth Graham. 1955; 670 pages. Complete engineering fundamentals and processing data on all phases of electroplating. **$10.00**

☐ **PRODUCTION CONTROL** by Nyles V. Reinfeld. 1959; 340 pages. A practical guide to the principles and functions of production control—details forecasting, scheduling and inventory techniques—incorporates up-to-date research from 500 companies. **$8.00**

☐ **INDUSTRY AGREES ON 'BUILDING BLOCK' STANDARDS** by William E. Hoffman. **$1.00**

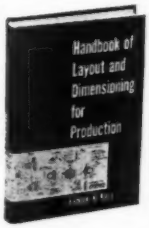
TECHNICAL

BOOKS BOOKS BOOKS BOOKS

☐ **FASTENERS HANDBOOK** by Julius Soled. 1957; 450 pages. Complete data, illustrations and descriptions covering all currently available industrial fasteners. **$12.50**

☐ **GEARS FOR SMALL MECHANISMS** by W. O. Davis. 20 chapters profusely illustrated covering theory, design and practice in cutting and generating gear tooth forms. **$5.00**

☐



HANDBOOK OF LAYOUT AND DIMENSIONING FOR PRODUCTION

by Hyman H. Katz

The functional principles of dimensioning in clear, interesting and succint English.

479 PAGES **$15.00**

REFERENCE

BOOKS BOOKS BOOKS BOOKS

☐ **HANDBOOK OF BARREL FINISHING** by Ralph F. Enyedy. 1955; 288 pages. Every phase of barrel finishing, including over 150 complete specification sheets and latest development. **$8.25**

☐ **INDUCTION & DIELECTRIC HEATING** by J. Wesley Cable. 1954; 590 pages. Up-to-date treatment on high frequency heating. **$13.50**

☐ **INSTRUMENTS FOR MEASUREMENT & CONTROL** by Werner G. Holzbock. 1955; 416 pages. Fully describes, illustrates and compares all current devices for measuring and controlling temperature, moisture, pressure, flow, uniformity, etc. **$10.00**

☐

MATHEMATICAL PROGRAMMING

by Reinfeld & Vogel. 274 pages. The practical application and use (rather than theory) of mathematics in industrial programming. **$8.00**

☐ **MACHINING, HEAT TREATMENT & PICKLING OF STAINLESS** by Lester F. Spencer. 36 pages on the working of stainless steel. **$1.50**

☐ **MICROSTRUCTURES OF DIAMOND SURFACES** by S. Tolansky. 11 chapters of original research. New optical techniques explained. **$8.50**

☐ **PLASTICS ENGINEERING HANDBOOK,** compiled by The Society of the Plastics Industry. 850 pages. **$15.00**

☐ **PRINCIPLES & METHODS OF SHEET METAL FABRICATING** by George Sachs. 1951; 537 pages. Describes in detail sheet metal forming methods, metallurgical effects in stamping, drawing, extruding, bending; design of parts and dies, etc. **$11.00**

☐ **PROTECTIVE COATINGS FOR METALS** by Burns and Bradley. 2nd edition. 1955; 657 pages. Latest information on the composition, properties and performance of metallic and organic coatings. **$12.50**

☐ **A DICTIONARY OF METALLURGY**

by A. D. Merriman

G.C., O.B.E., M.A., D.Sc., C.I. Mech. E., F.R.S.E.

400 PAGES
Profusely Illustrated

Just published February 16, 1959. Prepared by Dr. Merriman, Secretary of the Institution of Metallurgy, Great Britain, this is the most comprehensive work of its kind ever to appear in print. The Dictionary of Metallurgy provides:

- 7,000 definitions
- 283 illustrations
- 236 tables—including those constants invaluable for reference purposes
- An appendix which includes a Table of Common Abbreviations and Symbols, a Table of Abbreviations Used in Foreign Literature, and a Table of Physical Properties of Metals.

$25.00

☐

TECHNIQUES OF PRESS-WORKING METAL

by Eary & Reed, 472 pages. 20 chapters and hundreds of drawings cover this subject in highly comprehensive detail. **$12.00**

☐ **THE PRINCIPLES OF INVENTORY MANAGEMENT** by Nyles V. Reinfeld. An authoritative 32-page treatise on the economic aspects of analysis within your existent inventory control system. **$2.00**

☐ **TREATISE ON MILLING & MILLING MACHINES** by The Cincinnati Milling Machine Co. 896 pages, over 200 formulas and 700 illustrations and charts. **$8.00**

☐ **THE ACCURACY & GEOMETRY OF PRECISION SURFACE PLATES, ANGLES & STRAIGHT EDGES** by E. Willard Pennington. **$ .75**

AMOUNT OF ORDER $_____

Open account shipments to rated companies. Otherwise payment with order, please. No C.O.D.'s. Ohio customers add 3% sales tax. Quantity prices quoted on request.

COMPANY _____

CITY _____ ZONE _____ STATE _____

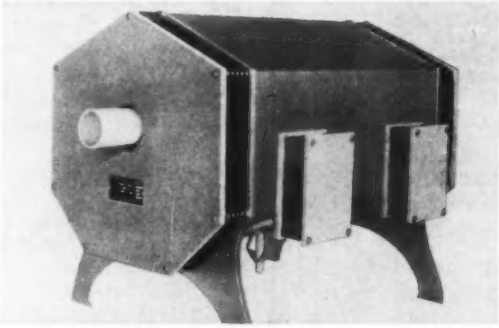
ADDRESS _____

BY _____ TITLE _____

Product News

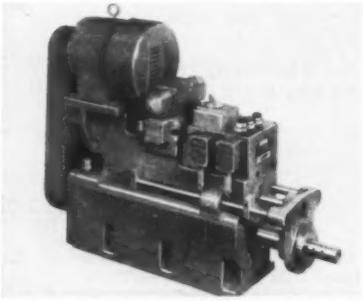
High-Temp Tube Furnace

Longer, more uniform heated zones is a feature of Model VL high temperature tube furnaces which quickly heat up to 275°F. Three sizes available with up to 3½" tube bores and 18" long heating chambers. Used in metal, ceramic, chemical, and electrical fields. The Sentry Co., Foxboro, Mass., or Circle No. P1.



Quill-Type Power Unit

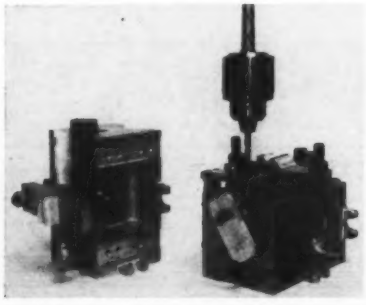
By using standard components this quill-type hydraulic power unit provides versatility of application and maximum economy. It has a



total stroke of 12" with 4" feed stroke and maximum spindle thrust of 2455 lbs at 500 psi operation. It rotates and feeds drills, reamers, counterbores, and spotfacers either singly or in multiple. F. Jos. Lamb Co., 5663 E. 9-Mile Rd., Detroit 34, or Circle Inform-A-Gram No. P2.

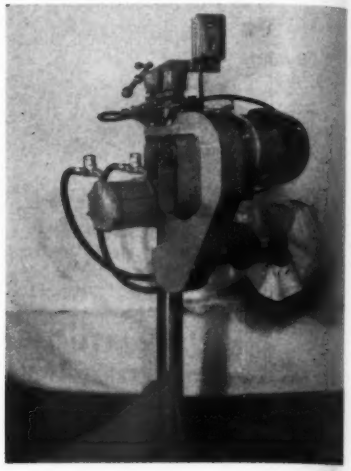
Multi-Purpose V-Block

This new V-block eliminates layout and costly jigs in drilling holes in round or hex stock. A stop is furnished to drill any distance from the end and also to hold work square for many drilling and milling operations. It can be mounted vertically or horizontally on drill presses, milling machines, or lathe face plates. Nu-Dres Tool Co., 1534 D., E. Chestnut Ave., Santa Ana, Calif., or Circle Inform-A-Gram No. P3.



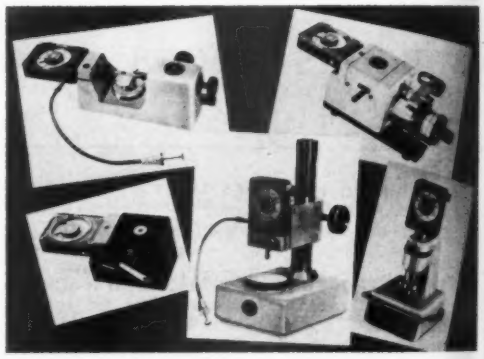
Spindle Stand Unit

This universally adjustable spindle polishing stand incorporates automatic oscillation to eliminate streaks or pattern. Can be used with many polishing wheels. Grinding & Polishing Machinery Corp., 2530 Winthrop Ave., Indianapolis 5, Ind., or Circle No. P6.



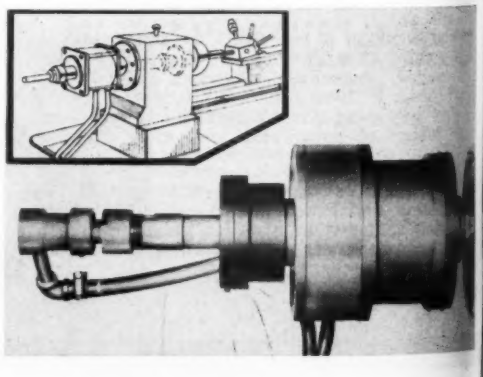
Miniature Work Gages

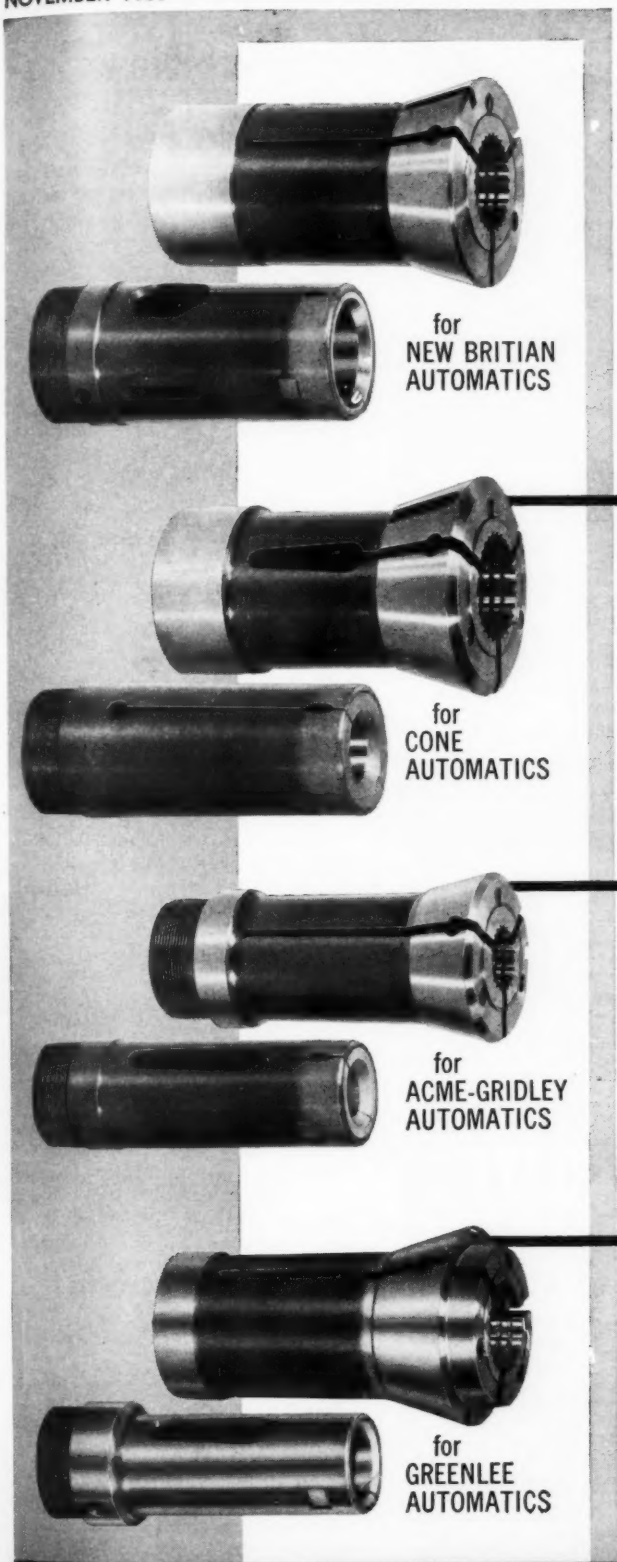
Five new gages added to the Kwick-Chek line include tools that permit rapid gaging of bores, recesses, and grooves. Accuracy is within 0.00005". The Micro dial indicator on each gage features both zero and tolerance - pointer adjustments. Industrial Div'n, Hamilton Watch Co., Lancaster, Pa., or Circle No. P4.



Versatile Collet Actuator

Dependable holding power for bar or chucking work is provided by this versatile non-rotating collet actuator that automatically opens and closes chucks and collets. Collet clamping forces are transmitted through the actuator itself, eliminating substantial wear from spindle bearings. Acme Industrial Co., 200 N. Laflin, Chicago 7, or Circle No. P5.





HARDINGE
ELMIRA, N.Y.

MASTER COLLETS AND MASTER FEED FINGERS

for ECONOMY and PERFORMANCE

Hardinge Master Collets and Hardinge Master Feed Fingers — both with low-cost, interchangeable pads — solve production and cost problems for all automatics.

Hardinge Style "S" Master Collets are the only masters *with no work pressure on the screw* . . .

Hardinge Style "B" Master Feed Fingers save from 30% to 80% over conventional solid feed fingers.

Also
Master Feed Fingers and Pads for Brown & Sharpe, Cleveland and Davenport Automatics

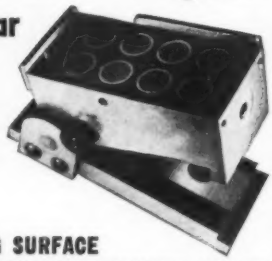
HARDINGE BROTHERS, INC., ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

Immediate stock delivery from Elmira, Boston, Atlanta, New York, Hartford, Philadelphia, Dayton, Detroit, Seattle, Portland, Minneapolis, Chicago, St. Louis, Oakland, Los Angeles, Toronto.

CIRCLE INFORM-A-GRAM KEY NO. 89

LOW COST 5" Magnetic Sine Bar



ONLY $149.95

MODEL #1805M

5" x 3"

WORKING SURFACE ON PERMANENT MAGNETIC CHUCK

Positive locking provides rigid set-up for light machining operations. End and side plates allow accurate locating of pieces on magnetic chuck making it a versatile, low cost fixture. Ideal for production, inspection or tool room.

OTHER MODELS include 5" and 10" sine bars and plates, single and compound angles, plain and magnetic. Solid oak cases available.

The complete Bald Eagle line starts at $21.75, F.O.B. St. Paul. Order your sine bar or plate from your dealer or direct.

BALD EAGLE PRODUCTS DIV.

356 Cedar Street, St. Paul 1, Minnesota

CIRCLE INFORM-A-GRAM KEY NO. 901

SPEEDS UP PRODUCTION

CUTS COSTS

ENCO Self-Indexing HEXTURRET

Convert your lathes for turret work this quick, easy way. ENCO HEXTURRET gives you the *accuracy, rigidity* and *speed* you need to step up lathe production and cut "per piece" costs. Easy as mounting your lathe tailstock. Does both normal and heavy lathe and screw machine work, drilling, counter boring, counter sinking, spot facing, reaming, turning, boring, etc. Fit all lathes 9" to 16" swing.

Mail coupon for cat. #53 and name of nearest Enco Franchise Dealer.

ENCO Mfg. Co.
4520 W. Fullerton
Chicago 39

PRECISION ENCO ECONOMY

ENCO Manufacturing Co.
4520 W. Fullerton
Chicago 39 Dept. 7119

Please send catalog #53 and full details of ENCO HEXTURRETS.

Name_____

Firm_____

Address_____

CIRCLE INFORM-A-GRAM KEY NO. 902

WALLS TU-WAY BELT SANDER

Full 1/3 h.p. G. E. Motor

USE IT EITHER WAY

VERTICAL

At last, a top quality industrial sander that provides all the most wanted features — yet sells for so little.

complete with cord, plug, switch ready to use **$89.95**

Illustrated Literature on Request

A few desirable distributor territories still available.

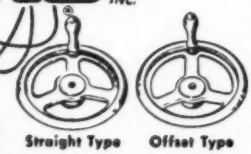
WALLS SALES CORPORATION

333 Nassau Avenue Brooklyn 22, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 903

Tomco INC.

HAND WHEELS



Straight Type Offset Type

SPECIALS

- HAND KNOBS
- MACHINE HANDLES
- HANDLES
- BALL HANDLES
- LEVERS
- SPECIALTIES

GRADUATED DIALS

SPECIFY TOMCO FOR DEPENDABILITY

A Complete line of high grade hand knobs, levers, handles, hand wheels, graduated dials is available for immediate shipment from stock of standard items. Specialty items made to your specifications.

WRITE FOR INFORMATION

Tomco INC.

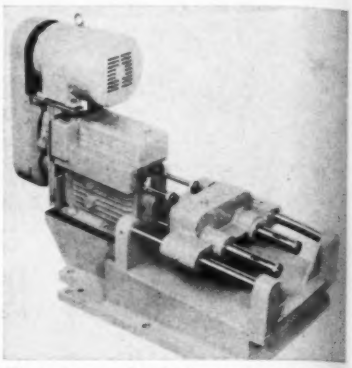
RACINE 2, WIS.

CIRCLE INFORM-A-GRAM KEY NO. 904

Product News

Money-Saving Drill

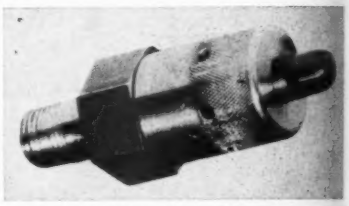
This new Peck-Drilling unit has a unique step and repeat action.



There's no shock to tools with this unit because at the end of each step the drills automatically pull out the chips, and then at the start of the next step they stop just short of the previous depth. Drillunit, Inc., 3267 Wight St., Detroit 7, or Circle Inform-A-Gram No. P7.

Energizing Poppet Valve

The Pulse-Air poppet valve is used as an energizing medium for pilot-operated air-control valves. It opens and closes when the plunger



is compressed only, eliminating decompressing the plunger before the valve is energized in the opposite direction. Savage Engineering Div'n, The Lithibar Co., 345 W. 14th St., Holland, Mich., or Circle Inform-A-Gram No. P8.

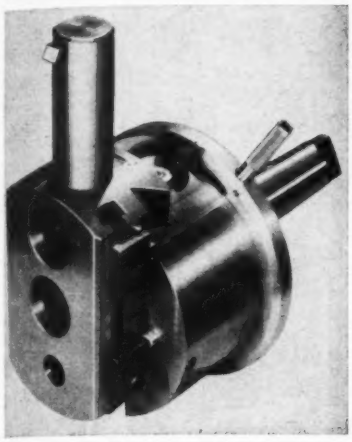
Rod End Coupler

For air and hydraulic cylinders, this new self-aligning rod end coupler insures precision axial alignment between cylinder and machine and simplifies installation both on new and existing equipment. Hydro-Line Mfg. Co., 5600 Pike Rd., Rockford, Ill., or Circle No. P9.

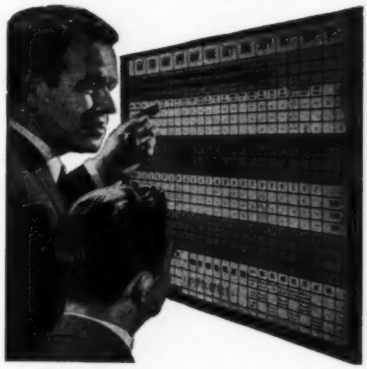
Product News

Small Diameter Heads

Continuous radial feed is the feature on the new small-diameter Davis boring heads. They're used for small-diameter boring, facing, turning, counterboring, backfacing, and grooving, on all types of rotating-spindle machines. Radial Feed is adjustable to 0.0001" or finer. Davis Boring Tool Div'n, Giddings & Lewis Machine Tool Co., Fond du Lac, Wis., or Circle No. P10.



You Get Things Done With Boardmaster Visual Control



☆ Gives Graphic Picture of Your Operations—Spotlighted by Color
☆ Facts at a glance—Saves Time, Saves Money, Prevents Errors
☆ Simple to operate—Type or Write on Cards, Snap in Grooves
☆ Ideal for Production, Traffic, Inventory, Scheduling, Sales, Etc.
☆ Made of Metal. Compact and Attractive. Over 400,000 in Use

Complete price $49.50 including cards

FREE 24-PAGE BOOKLET Z-500 Without Obligation

Write for Your Copy Today

GRAPHIC SYSTEMS
55 West 42nd St. • New York 36, N.Y.
CIRCLE INFORM-A-GRAM KEY NO. 911

New!
ONLY.....$15★
Buys This Compact Mist Coolant Unit

*Complete With Magnetic Nozzle Holder As Shown (In U.S.A.)

Especially designed for small precision machinery used for drilling, tapping, sawing, grinding, etc. Up to 500% savings through increased cutting speeds and tool life. Check these quality features and write for complete details.

- *compact . . . measures 3" x 5"*
- *separate air and coolant controls*
- *convenient mounting stud*
- *attaches to existing shop airline*
- *shatter-proof 8 oz. reservoir*
- *neoprene flexible coolant line*
- *magnetic nozzle holder positions anywhere*
- *controlled discharge*

Larger Types and Capacities Available

SEND FOR BULLETIN NO. 37

TRICO FUSE MFG. CO.
MILWAUKEE WIS U.S.A.
CIRCLE INFORM-A-GRAM KEY NO. 915

DYKEM
STEEL BLUE
Stops Losses
making Dies and Templates
Popular package 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.
Write for sample on company letterhead
THE DYKEM COMPANY
2303L North 11th St. • St. Louis 6, Mo.
With DYKEM Steel Blue
Without DYKEM Steel Blue
CIRCLE INFORM-A-GRAM KEY NO. 912

Star Stainless screws have clean—bright and shiny—heads

STAR STAINLESS SCREW CO.
679 Union Blvd., Paterson 2, N. J.
Telephone: CLifford 6-2300
Direct N. Y. Phone: WI 7-6310
Direct Phila. Phone: WA 5-3660
CORROSION RESISTANT
CIRCLE INFORM-A-GRAM KEY NO. 913

WANT HIGH-SPEED MEASUREMENTS TO 10 MILLIONTHS . . .

CARSON-DICE
ELECTRONIC MICROMETERS

If you need to measure fragile or compressible parts to within .000010", then CARSON-DICE Electronic Micrometers are for YOU!

J. W. DICE CO.
ENGLEWOOD, N. J.
CIRCLE INFORM-A-GRAM KEY NO. 914

BORING BARS
★ Solid Carbide Head ★ Extra Long Shank
(at no extra cost)

Precision made double brazed head for longer tool life. Face grinding only, to resharpen solid head—for greater service at lower cost. Ideal for precision Jig Boring—Boring or facing shapes available, 3/8 or 1/2" shanks.

Write for Literature and price list
Dealer Inquiries Invited

TITAN TOOL SUPPLY CO.
Box L, 1419 Hertel Avenue, Buffalo 16, N. Y.
CIRCLE INFORM-A-GRAM KEY NO. 916

Product News

Steel Exhaust Shell

Exhaust system filter change is speeded up by using this steel exhaust shell that fits all standard Mistkops. The top of the shell is equipped with quick action clamps for fast removal. With the top removed, the old filter can be removed and a new one inserted in a few minutes. Aget Mfg., Adrian, Mich., or Circle Inform-A-Gram No. P11.

tion available from Barrett-Cravens Co., 628 Dundee Rd., Northbrook, Ill., or Circle No. P14.

Corrosion Inhibitor

Provide 100% protection against corrosion hazards in aqueous systems with a new water soluble cor-

rosion inhibitor, Rust-Lick "B", for ferrous metals. Bulletin 22 and free sample available from Rust-Lick, Inc., 755 Boylston St., Boston 16, or Circle No. P15.

Improved Surface Grinder

The improved TML 6 x 12 floor model surface grinder features a redesigned oiling system to provide more oil on the ways to increase machine life and promote greater ease of operation. Get details from Harig Mfg. Corp., 5747 W. Howard St., Chicago 31, or Circle No. P12.

Deburrs Gears

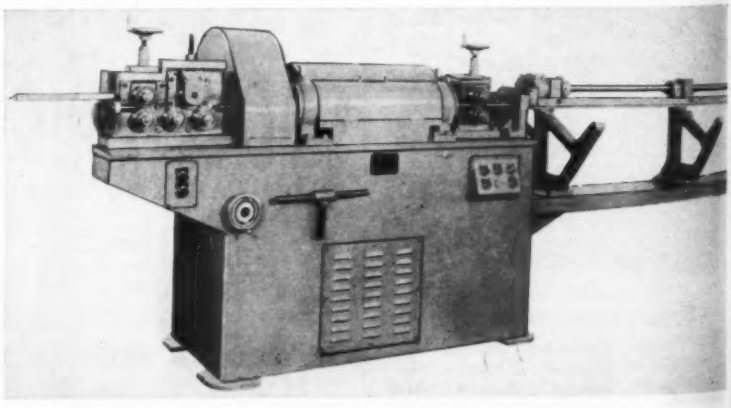
This semi-automatic gear deburring machine economically removes burrs from spur, helical, and bevel gears. Entire form is deburred without changing gears, followers, or templates. Short or long run production, quick setup, and standard tooling are features. Get details from Redin Production Machine Co., 2433 20th St., Rockford, Ill., or Circle Inform-A-Gram No. P13.

Handy Walkie Tractor

Ideal for economical movement of stock and merchandise in plants, Model TG-12 hand tractor is suited especially for short runs, and for use in confined areas for rapid movement of trailer loads. Informa-

Wire Straightener and Cutter

Here's a wire straightening and cutting machine that handles from $\frac{5}{32}$" to $\frac{3}{8}$" dia wire. The variable speed units provide a choice of feed ranges from 50 to 200 ft/min. The Shuster 2ABV comes in 49 models from 0.020" to $1\frac{1}{16}$". Get details from Mettler Machine Tool Inc, Adeline St., Cor. Blvd., P. O. Box 883, New Haven 4, Conn., or Circle Inform-A-Gram No. P16.



Gaertner Toolmakers' Microscope used to measure typical piece part. Co-ordinate range 4" x 2".

Precise measurement to 0.0001" and 1 min. of arc

Gaertner Toolmakers' Microscope

Here is a reliable, easy-to-use microscope for precise measurement of piece parts, tools, dies, thread gages, templates, jigs, fixtures, etc. Ideally suited for making a wide variety of precision measurements and is especially valuable in reducing rejects in production work.

With the Gaertner Toolmakers' Microscope you make direct, non-destructive measurements — no contact, no distortion, images are sharp and clear. It is a basic measuring instrument for inspection depts., gage labs, tool and die and model shops, industrial and research labs.

The Gaertner Toolmakers' Microscope has been proven in use by U. S. Government Gage Laboratories, and by prime contractors and their subcontractors. With all parties using the same measuring instrument, inspection procedures are co-ordinated and disagreements and rejects minimized.

Features that help you get
HIGH SETTING AND REPEATING ACCURACY

- Low, compact built-in rotary stage reads to 1 minute of arc throughout 360° range.
- Minimum overhang of stages.
- Full 2" precision-lapped lead screws with correction device.
- Straightforward, direct, uncomplicated optical system.

Features that assure you of
EASY, CONVENIENT OPERATION

- Independently rotatable cross hairs in protractor ocular speed up measurements, simplify measuring procedure.
- Convenient location of ocular eyepieces for ease of reading.
- Built-in transformer and plugs for all illuminators.

Modifications and accessories to
MEET YOUR EXACT REQUIREMENTS

- Thread and radius templates, camera and spotting attachments, fine motion focus, variable magnification available.
- If you have a special measuring problem, our staff of representatives will be happy to consult with you. The service and engineering facilities of the manufacturer are always immediately available to help you.

Write for Bulletin 147-56

Designed and manufactured by

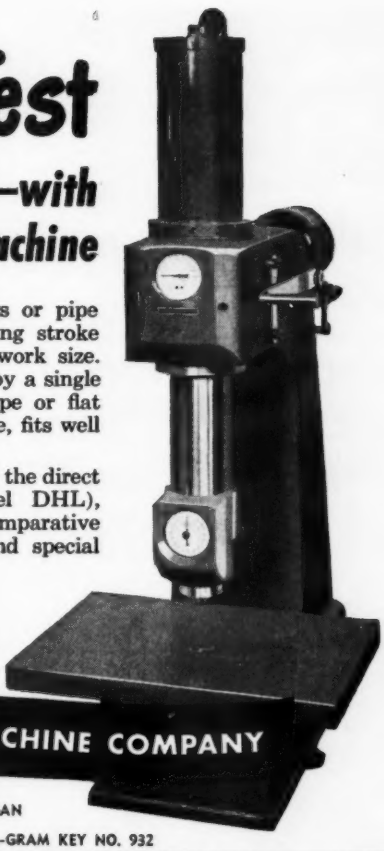
The Gaertner Scientific Corporation

1242 Wrightwood Ave., Chicago 14, Ill
Telephone: BUckingham 1-5335

CIRCLE INFORM-A-GRAM KEY NO. 931

Brinell Test

large pieces fast—with this long stroke machine



Large awkward castings, forgings or pipe are easily tested because the long stroke eliminates screw adjustment to work size. The hydraulic ram is controlled by a single lever. Large, stationary roller-type or flat table makes work handling simple, fits well into a conveyor line.

Choice of plain Brinell machine or the direct reading machine (shown, model DHL), where dial at end of ram gives comparative hardness immediately. Larger and special machines may also be had.

Write for more information on all our Brinell testing machines.

DETROIT TESTING MACHINE COMPANY

9386 GRINNELL AVENUE, DETROIT 13, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 932

DISHED

STRAIGHT

COUNTER BALANCED

REID TOOL ROOM ACCESSORIES, HIGH QUALITY LOW PRICES!

CAST IRON HAND WHEELS

Made in types shown of fine grain cast iron. Rims and handles are ground and polished to high lustre. Many sizes. Top quality. Low prices.

MALLEABLE MACHINE HANDLES

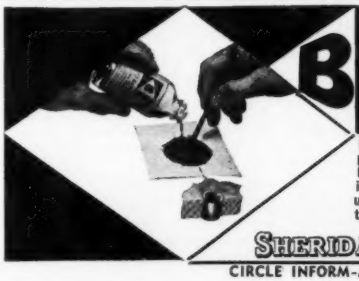
STRAIGHT

In straight, crank and offset types. Many sizes. Strong, Neat. Ready for use.

FREE. Send today for big 78 pg. catalog listing 1600 items needed in your tool room.

REID TOOL SUPPLY COMPANY
MUSKEGON HEIGHTS · MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 933



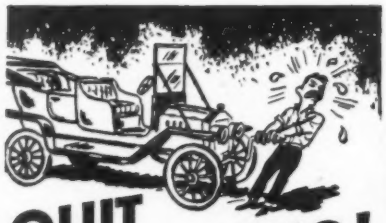
BK #7 CEMENT

BONDING AGENT FOR RETAINING OF DRILL JIG BUSHINGS

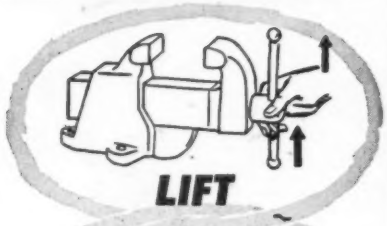
No distortion of the jig plate or misalignment of the hole pattern. Eliminates lapping of press fit bushings after assembly. Not affected by drilling heat. Bushings can be retained in steel, aluminum or fiberglass jigs. Easily applied by untrained personnel. Especially recommended for use in "master tooling" operations. Write for illustrated literature.

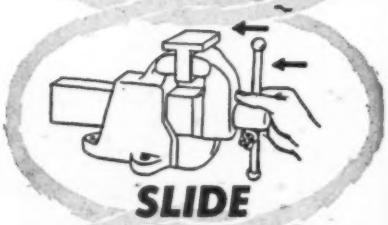
SHERIDAN PRODUCTS INC. 1054 E. HYDE PARK BLVD. INGLEWOOD 3, CALIF.

CIRCLE INFORM-A-GRAM KEY NO. 934



QUIT CRANKING!
...NEW model CARDINAL
SPEEDVISE
SLIDES!


LIFT


SLIDE

LOCK

production costs go down
production capacity goes up!

BUY CARDINAL

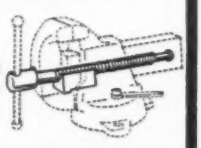
Modern plants require modern tools. The cost is quickly repaid in increased efficiency and time saved.

SIZES, 3½", 4", 4½" stationary or swivel base.

SOLD EVERYWHERE

FAST - SIMPLE POSITIVE

Patented undercut thread of screw and nut assure positive locking.



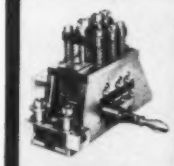
SEND FOR OUR NEW CATALOG

CARDINAL MACHINE CO.
1819 DANA ST., GLENDALE, CALIF.
CIRCLE INFORM-A-GRAM KEY NO. 941

Buy DURANT

PRESS ROOM EQUIPMENT

STANDARD STOCK STRAIGHTENERS
Made in nine standard sizes to meet most requirements. Widths from 2" to 8"; roll combinations range from 5 to 9. Special sizes available to specific requirements.



RAM SCRAP CHOPPER
Low cost, operated by press ram, independent of die. Easily bolted to press.

FOUR MODELS
M1 takes stock 3" wide .062 thick
M2 takes stock 6" wide .062 thick
M3 takes stock 10" wide .100 thick
M4 takes stock 12" wide .100 thick

AUTOMATIC STOCK REEL
Operates by natural spring of uncoiling stock. Platen turns on ball bearings. No motor, belts or sprockets. Loop of stock stops slippage, kick back, and over run. Speed limits controlled only by feed.

Write Now for new catalog showing prices and complete line of Equipment.

DURANT Tool Supply Co.
1-15 THURBERS AVENUE
PROVIDENCE 5, RHODE ISLAND

CIRCLE INFORM-A-GRAM KEY NO. 942

COMPLETE THE DIE-SET AT YOUR BENCH

Lacey Die-Set Machine

Here's a truly "one man" press. It operates with one hand. Handy for tool and press rooms, it permits the die-maker to complete a die-set at his bench . . . saves toolroom and handling costs. Ask today for full details.

Sole Distributors

MOORE SPECIAL TOOL CO., INC.
726 Union Avenue Bridgeport 7, Conn.

CIRCLE INFORM-A-GRAM KEY NO. 943

Product News

Milling Head

Convert Veet planers or old machines to money-saving machines by attaching a new milling head. The Speedmiller is a two speed head rated at 30 hp at 900 rpm and is capable of milling all grades of steel and cast iron. Veet Industries, 25753 Groesbeck Hwy., E. Detroit, or Circle Inform-A-Gram No. P17.

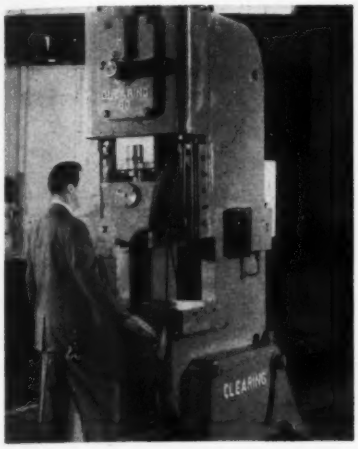
High Production Marking

For rolling an annular groove around tubular parts, and identification and part number marking at a production rate of 5000/hr, use the Model 523 marking machine. It's done with a single roll forming die and with no distortion to the completed piece. Get details from The Noble & Westbrook Mfg. Co., E. Hartford, Conn., or Circle Inform-A-Gram No. P18.

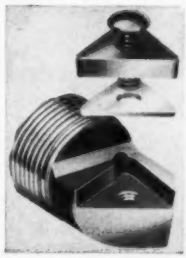
Product News

New 60-Ton Press

A 60-ton model has been added to the Torc-Pac OBI press line. This standard press is built on the modular principle and consists of interchangeable frame, drive, and head. It features the unique air-friction clutch. Clearing Division of U. S. Industries, Inc., 6499 W. 65th St., Chicago 38, Ill., or Circle Inform-A-Gram No. P19.

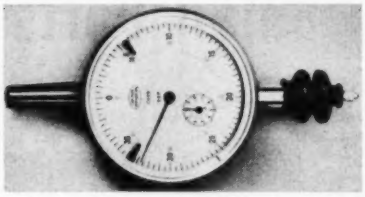


Cost-Saving Combo



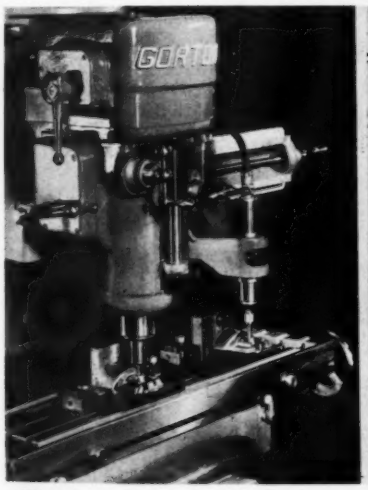
A specially designed Microbore cutting tool holder and Kendex throwaway inserts reduce replacement costs and give fast indexing. Ideal for rough cutting, this combination can use the hardest grades of carbide inserts because no brazing is required. Get details from DeVlieg Microbore Div'n, DeVlieg Machine Co., Fair St., Royal Oak, Mich., or Circle Inform-A-Gram No. P21.

Durable Dial Indicator

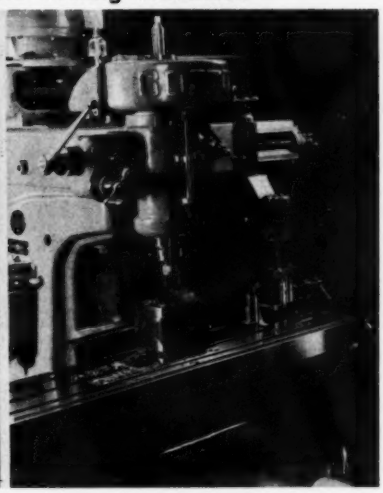


Here's a waterproof and oilproof dial indicator that won't be hurt when exposed to oil, water, or abrasives. Made completely of steel, the dial has a 2¼" dia graduated 0-40, and reads directly in 0.0005". Get price list from Mahr Gage Co. Inc., 274 Lafayette St., New York 12, or Circle Inform-A-Gram No. P22.

Two New Automatic Milling Machines



The three-dimensional duplicator (left) features 180° automatic tracer and handles dies, molds, patterns, and other milling of intricate convex or concave surfaces at high speeds and close tolerances. Bulletin 2968 is available from George Gorton Machine Co , 1321 Racine St., Racine, Wis., or Circle No. P20.



Another model (right) boasts fast, accurate profiling with 360° automatic tracing. It's ideal for production profiling inside or outside of simple or complex shapes, and machining extrusion dies, punch and die sets. Bulletin 2972 available from George Gorton Machine Co., Racine, Wis., or Circle No. P23.

LIFTING DEVICES
for
FAST • SAFE • BETTER
Material Handling
of
• SHEETS
• COILS • BOXES
• MOLDS
• DRUMS • PALLETS
400 MODELS
H. L. Bushman Co.
100-A W. Central Ave.
Roselle, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 951

JIG BORING
and
Large Precision Machining
Done to your specifications
We Have
22 Jig Borers
KIDDE PRECISION TOOL CORPORATION
10 Locust Ave., Roseland, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 952

CAMS ALL TYPES MADE TO YOUR SPECS

"Cam Calculating Service"
Dr. Chas. Eisler ME, Founder
Chas. Eisler, Jr., Pres.
EISLER ENGINEERING CO., INC.
732 SO. 13TH ST. NEWARK 3, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 953

DRILL THESE HOLES
BY A QUICK, EASY, INEXPENSIVE METHOD
Your business letterhead will bring literature.
WATTS BROS. TOOL WORKS
Wilmerding, Penna.

CIRCLE INFORM-A-GRAM KEY NO. 954

HARDNESS TESTING
has been done with the **SCLEROSCOPE**
Since 1907
•
THE SHORE INSTRUMENT & MFG. CO., Inc.
90-35 Van Wyck Expressway
Jamaica 35, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 955

Product News

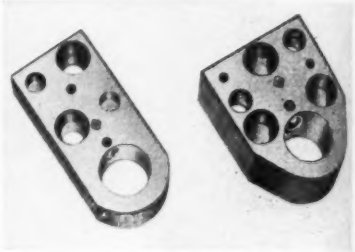
Versatile Band Saw

This new horizontal metal cutting band saw is for cutting a wide variety of materials in jobs where large capacity is needed with restricted length of cut. Model X-60 has 60" x 60" capacity and 18" maximum length of cut. W. F. Wells & Sons, Three Rivers, Mich., or Circle Inform-A-Gram No. P24.

Large Base Router

An enlarged base and three cutting accessories make the 31R-730B air-powered router a more versatile tool for straight and intricate contour cutting of metals, plastics, and honeycomb. Get details from Buckeye Tools Corp., 5003 Springboro Pike, Dayton 1, Ohio, or Circle Inform-A-Gram No. P25.

Easy-To-Pull Retainers



Easily remove these retainers for standardized ball-locking punches from dies without pinch bars, wedges, and hammers and eliminate breaking pins and damaging a good retainer. Two ordinary screws, a few twists of a wrench, and the retainer is free of the dowel pins. Get details from Porter Precision Products, Cincinnati 15, Ohio, or Circle Inform-A-Gram No. P26.

Optical Comparators

Rapid, accurate inspection of close tolerance, precision, small and large parts is possible with the new Projecto-Graph optical comparator, units, available with 10 to 100 power magnifications. They permit convenience of interchanging magnifications without any other adjustment. Projecto-Graph Instruments Corp., Clinton, Conn., or Circle No. P27.

Precision Grind Small Parts On A *Fortuna*

The Fortuna 200 series of cylindrical grinding machines provides accurate, dependable grinding of a wide variety of small parts—injection needles, servo valves, watch parts, or wherever highest accuracy is required. Parts can be ground between centers, with high-precision collets, in chucks, or on face plates.

With a Fortuna even unskilled operators can obtain extremely fine limits of accuracy—as close as .00002" (twenty millionths).

A Fortuna UME 200 Universal Cylindrical Grinding Machine

LME 200—For internal grinding.

RME 200—For external grinding.

UME 200—For universal grinding—with double-swivel grinding head if desired.

Also available—all types of precision internal grinding spindles—including high frequency spindles up to 180,000 r.p.m.

Write For Additional Information

COSA —*nationwide sales and service of precision machine tools—from bench lathes to boring mills.*

COSA CORPORATION, 405 LEXINGTON AVENUE, NEW YORK 17, N.Y.

In Canada contact COSA CORPORATION OF CANADA, LTD., 1160 Lakeshore Dr., Long Branch, Toronto 14, Ont.

CIRCLE INFORM-A-GRAM KEY NO. 96

ACME TAPS From Stock!

HIGH PRODUCTION TYPE
with Exclusive
"Lead Screw Pilot"

Improve Acme Tapping with Single Pass Acme Taps. Eliminate Shaved Threads, Improve Finish, Reduce Machining Time.

H&R
The Threading Specialists
5850 Marshall St., Oakland 8, California
OUR 23RD YEAR

CIRCLE INFORM-A-GRAM KEY NO. 971

A COMPLETELY MOBILE CONVERTIBLE BAND SAW with more capacity and more versatility

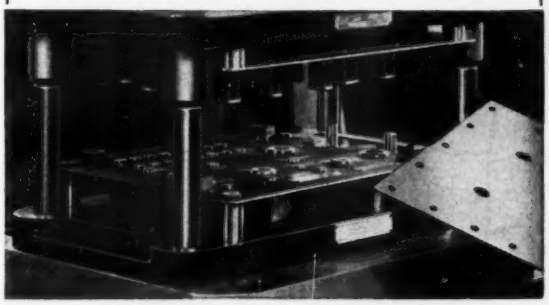
THE WELLS MODEL 58-B

Here's a compact, convertible band saw that provides the capacity you've been looking for . . . at a modest price. Equipped with optional wheel handle unit, the Model 58-B becomes completely mobile . . . easily rolls from job to job. Use the 58-B as a horizontal cut-off machine (capacity: 6" x 10") or swing the head to upright position, install work table and it's a utility vertical band saw. See your Wells Distributor or write for Bulletin 262.

The Pioneers of Horizontal
Wells
METAL CUTTING BAND SAWS
WELLS MANUFACTURING CORPORATION
1940 Cedar Street • Three Rivers, Michigan

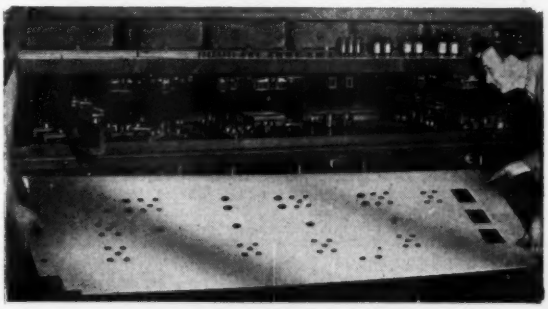
CIRCLE INFORM-A-GRAM KEY NO. 972

OVER 2700 PLANTS are saving money with WHISTLER DIES



MAGNETIC PERFORATING DIES

All parts reusable and interchangeable. Punches and dies stocked in .001" increments from .100" thru .500" dia. Larger sizes available.



ADJUSTABLE PERFORATING DIES

All parts reusable and interchangeable. Punches and dies stocked in .001" increments from .100" thru .500" dia. Larger sizes available.

manufacturer of all types of CUSTOM DIES for over 40 years

WRITE FOR COMPLETE DETAILS

S. B. WHISTLER & SONS, INC.
748 Military Rd., Buffalo 23, N. Y.

Mail the following: ☐ Magna-Die Catalog ☐ Adjustable Die Catalog
☐ More information on custom die work

NAME _____ TITLE _____
COMPANY _____
STREET _____
CITY _____ ZONE _____ STATE _____

CIRCLE INFORM-A-GRAM KEY NO. 973

Stop slow, bumbling driving methods

GO MAGNETIC
WITH
Magna-tip®
SCREW DRIVING ACCESSORIES

You can speed assembly operations and stop inefficient fumbling with Magna (Permanently Magnetic) bit holders, finders and sockets. Fit all power screwdrivers to hold screws, bolts or nuts firmly for one-hand driving. Hundreds of plants are now using them profitably. Ask your power screwdriver salesman for details.

WRITE for manual on the complete line of Magna-tip bit holders, finders, sockets and hand screwdrivers. Dept. 88G4, Magna Driver Corp., 779 Washington St., Buffalo 3, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 981

ELIMINATE WEAR ON YOUR COSTLY DIE SETS

WITH INEXPENSIVE
ACRO
LEADER PIN OILERS

Pin oilers in place on die set.

These simple, inexpensive pin oilers fit over each leader pin and seal in place with a rubber neoprene washer. Each cup is filled with oil so each downward stroke brings bushing in contact with oil and upward stroke distributes oil evenly over leader pins. You'll eliminate bushing wear, leader pin scoring, and maintain die accuracy with these oilers.

Order today. Prices shown are F.O.B. Milwaukee.

Pin dia. ⅞", 1" or 1⅛"	Pr.	$ 6.50
Pin dia. 1¼", 1½" or 1¾"	Pr.	8.00
Pin dia. 2"	Pr.	10.00
Pin dia. 2½"	Pr.	12.00
Pin dia. 3"	Pr.	14.00

FREE FACTS covering four more money saving accessories for your plant are included in this new folder. Write today. Ask for bulletin TP59.

ACRO METAL STAMPING COMPANY
338T E. Reservoir Ave., Milwaukee, Wis.

CIRCLE INFORM-A-GRAM KEY NO. 983

FREE NEW-16 PAGE CATALOG
WRITE FOR YOUR COPY TODAY

JIG AND FIXTURE COMPONENTS
- LATCH BOLTS
- CAST IRON HAND KNOBS
- ALUMINUM HAND KNOBS
- QUARTER TURN SCREWS
- SHOULDER SCREWS
- JIG FEET (3 TYPES)
- SPHERICAL WASHERS
- FIXTURE KEYS
- KNURLED HEAD SCREWS
- TOGGLE SHOE CLAMPS & V-PADS

HOLD DOWN AND CLAMPING TOOLS
- T-NUT & STUD SETS
- STEP BLOCK & CLAMP SETS
- FLANGED NUTS
- CUT THREAD STUDS
- TEE NUTS
- COUPLING NUTS
- ADJUSTABLE STEP BLOCKS
- STRAP CLAMPS (PLAIN & STEP TYPE)

CATALOG INCLUDES TRACING TEMPLATES

Northwestern NORTH WESTERN
116 HOLLIER AVE., DAYTON 3, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 982

TOOLING BALLS

- Durable; corrosion-resistant. Made of Type 440-C stainless steel, hardened to 55-58 Rockwell C.
- Highly accurate. Ball size held to ±.0001" for fixture balls; ±.00002" for checking balls.
- In stock: Types 224 and 448 in 7 ball sizes, ¼" to 1" by ⅛" steps; Type 348, with ½" ball and shouldered shank tapped 6-32. Other sizes to order.

WRITE FOR price list and ASTE Data Sheet

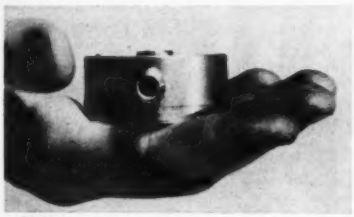
INDUSTRIAL TECTONICS, Inc.
ITI
MANUFACTURERS OF PRECISION BALLS AND BEARINGS
3693 JACKSON ROAD
ANN ARBOR, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 984

Closed Circuit TV

Included in the new Motorola closed circuit industrial television line is this camera available in four versions providing locked or random interlace, and automatic or manual light compensation. The rugged 14″ monitor provides almost perfect interlace of fields when used with the locked interlace cameras. Information available from Motorola, Inc., 4501 W. Augusta Blvd., Chicago 51, or Circle Inform-A-Gram No. P28.

Space-Saving Cylinders



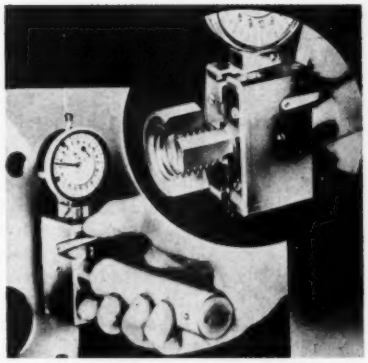
Utilize air power within space limitations heretofore impossible with the new Pancake line of low pressure air cylinders. They're offered in pressure ratios ranging from 1:1 (line pressure) to 3 times line pressure, and with strokes from 0.010″ to 1″. Write Fabco, 1231 Main Ave., Cleveland 13, for details, or Circle Inform-A-Gram No. P29.

High Speed Tool Bits

These new general-purpose long-life tool bits are made from a high vanadium analysis high speed steel which gives them exceptionally fine performance and high abrasive characteristics. They're also noted for high impact strength. Threadwell Tap & Die Co., Greenfield, Mass., or Circle Inform-A-Gram No. P30.

Speed Thread Inspection

Speed up inspection of internal threads with this new dial thread plug gage. It performs the go and no-go inspection in one operation. The gage can also be converted into an adjustable plug gage for measuring smooth bores or diameters of nuts. Sizes from 0.080″ to 4.800″ are available from Mahr Gage Co., Inc., 274 Lafayette St., New York 12, or Circle Inform-A-Gram No. P31.



CONTOUR GRIP

on a lathe... Contour Grip works with any two, three or four jaw chuck, wrench or air operated.

on a milling machine ... Contour Grip makes high speed milling of tough-to-hold parts easy.

on a grinder... this multiple set-up on a Blanchard helped a manufacturer increase his output ten-fold!

SET UP ANY JOB IN SECONDS
then take deeper cuts, faster feeds

Any tool becomes more productive when you use Bliss' new Contour Grip holding fixture; any operator becomes faster.

Contour Grip is a standard fixture that will hold any irregularly shaped part so tightly that you can feed faster and take deeper cuts. It can be used with *any* type of tool, eliminating the need for costly special-purpose jigs and fixtures. And, as picture above shows, your operator can set-up Contour Grip in seconds, then go from piece to piece just by backing off the jaws, dropping the next piece in and tightening up. For long runs or short, it's as simple and as quick as that.

The key to this all-purpose holding fixture's versatility is its individual steel fingers, each of which moves independently as it contacts the work. The fingers mold around the part, and then tighten up *giving greater holding power and a more positive grip than any ordinary fixture can.*

To learn how Contour Grip works and to see the various models available, see your local dealer or contact us direct.

SEND FOR BULLETIN

dieco DIE SETS

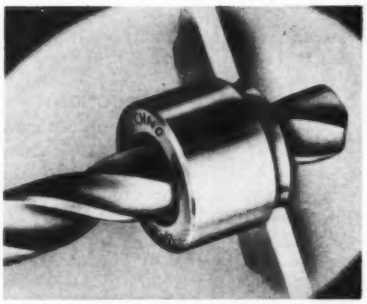
E. W. BLISS COMPANY
DIE SUPPLY DIVISION
1400 Brookpark Road
Cleveland, Ohio

Available in Canada through John Bertram & Sons, Ltd., Dundas, Ontario.
CIRCLE INFORM-A-GRAM KEY NO. 99

Product News

Reduce Installation Costs

The Flar-A-Lock drill bushings which save as much as 70% in tooling and are easy to install, are now available in two new sizes — for installation in 3/16" and 1/4" stock. The accuracy of the bushings prevents template distortion, eliminating waste. Get Catalog 103 from Techno-Products Corp., 405-11 Baily Rd., Yeadon, Pa., or Circle Inform-A-Gram No. P32.

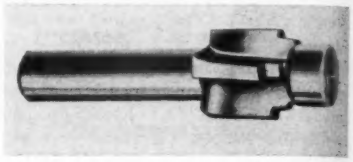


Multi-Nozzle Coolant System

This new pressurized mist coolant system delivers coolant mixture under pressure to banks of machinery

or a large number of stations. Up to 30 nozzles to a height of 15′ or parallel distance of 100′ can be serviced from a single dispenser. For details write Trico Fuse Mfg. Co., 2948 N. 5th St., Milwaukee 12, Wisc., or Circle Inform-A-Gram No. P33.

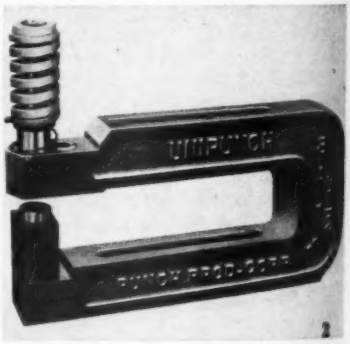
Hydraulic Contour Cutters



Port contour cutters for profiling the recently introduced SAE internal O-ring boss for the new straight thread tube fittings are now available in high speed steel from Craig Tools. They come with plain and reamer pilots. Craig Tools, Inc., 133 Lomita St., El Segundo, Calif., or Circle Inform-A-Gram No. P34.

Long-Life Punching Units

All steel cast holders provide longer life by combining higher tensile strength and longer wear for



the new Unipunch Type AF Series hole punching units. They're ideal for punching holes in angles, extrusions, channels, and formed parts with lips or flanges. Punch Products Corp., 3800 Highland Ave., Niagara Falls, N. Y., or Circle Inform-A-Gram No. P35.

LAP FASTER
more accurately WITH FLEXOLAP

Flexolap features an expansion barrel with off-center longitudinal slots that "give" under pressure of the adjusting pin —allow up to 15% expansion. Easy, accurate take-up saves valuable time, enables you to lap rounder, straighter holes. Extra flexibility eliminates danger of galling or seizing.

SET NO. 1

includes 6 complete laps, one of each size (3/16", 1/4", 5/16", 3/8", 7/16" and 1/2"), and one additional brass barrel of each size, all on a sturdy stand. $14.00

OTHER SIZES

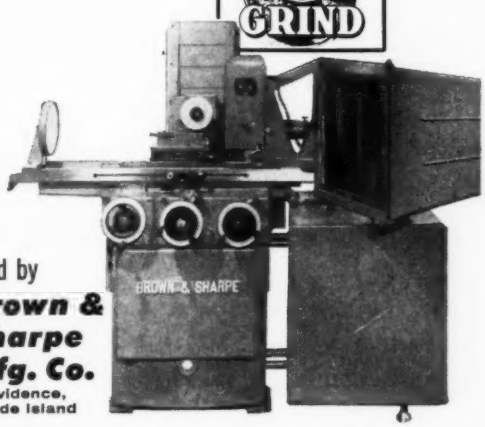
available are 7/32", 9/32", 11/32", 13/32", 15/32", 9/16", 5/8", 11/16", 3/4", and Midget Laps in sizes .032, .036, .040, .046, .054, .062, .070, .079, .090, .104, .120, .135, .155, .170, .187, .218 and .250. Trial assortment of 17 midget laps, $2.10

Write today for free catalog

FEDERAL TOOL CORPORATION
3600 W. Pratt Blvd., Chicago 45, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 100

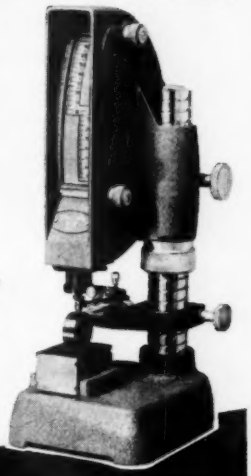
SAVE 50%
or more in
CONTOUR GRINDING COSTS with VISUAL GRIND



Sold by **Brown & Sharpe Mfg. Co.**
Providence, Rhode Island

Visual Grind is manufactured by
The CLEVELAND GRINDING MACHINE Co.
30510 LAKELAND BLVD. • WILLOWICK, OHIO
CIRCLE INFORM-A-GRAM KEY NO. 1011

Leitz TOLERATOR
THE TRU-VISION
COMPARATOR GAGE
Capacity 6" Diameter



- Positive action through low-ratio initial amplification of 4:1
- Additional optical amplification of 250:1 = total of 1000x
- Rapid quantity gaging between adjustable colored tolerance masks
- Selective inspection from long range illuminated scale with 100 divisions
- Direct effortless reading in .00005"
- Variety of interchangeable anvils and contact tips
- Instrument also available for internal gaging

Request 8-page catalog 82-177

OPTO-METRIC TOOLS, INC.
137TP VARICK STREET, NEW YORK 13, N. Y.
CIRCLE INFORM-A-GRAM KEY NO. 1013

JUST OUT!
NEW 1959 EDITION

free
84-PAGE CATALOG
One Complete Source of Detailed Specifications for Designers, Production Managers, Toolroom Foremen

Hundreds of NEW ITEMS

ALL NEW — Complete specifications and cost saving data on over 2000 "Standards", including world's largest line of work-holding equipment, chuck jaw blanks, handles, knobs, wheels, strap clamp assemblies, forged items, plus hundreds of other jig and fixture components. Detailed specifications, engineering drawings. The one complete source for data on all the "standards" for tool, die, jig, and fixture design and application. Write for your FREE copy today.

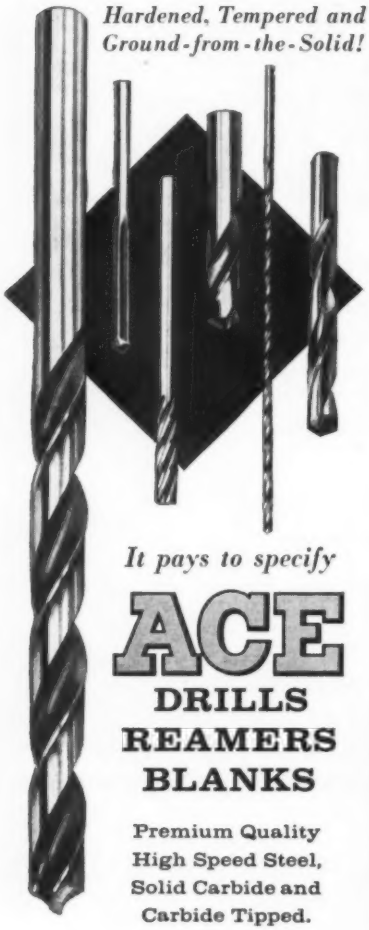
JERGENS TOOL SPECIALTY CO.
Dept. TP-11, 712 E. 163rd St., Cleveland 10, Ohio
CIRCLE INFORM-A-GRAM KEY NO. 1012

THE TRUTH ABOUT...
MARSHALL
LEADERSHIP
SPECIALISTS IN PREPARED TOOL STEELS
LEADERSHIP, like reputation, is earned by striving for perfection and by the consistent delivery of quality-controlled products. "He profits most who serves best".
LEADERSHIP is often copied—but never equaled! Marshall Steel Company makes available the largest stocks of Ground Flat Tool Steel on the market in three types.—
OILcrat: A fine grained electric furnace tool steel, oil hardening (S.A.E. O-1 Tungsten Type) Analysis.
AIRcrat: A 5% chromium fine grained electric furnace tool steel, air hardening. This is (S.A.E. type A-2) Analysis.
MARSHALLCrat: Low Carbon, silicon killed 1018, high-quality carbon steel. (Can be case-hardened or carburized)
Each of these 3 grades are metallurgically correct for proper heat treating . . . truly . . . The ARISTOCRATS OF GROUND FLAT STOCK.
We repeat . . . QUALITY IS OUR WATCH-WORD—MAKE IT YOUR BUYWORD.
If you want to know more about us—Write for latest catalog.

SOLD THROUGH SELECTED DISTRIBUTORS

"Em"blem of Excellence **MARSHALL STEEL COMPANY**
Box 108 , LaGrange, Illinois
Write for colorful Wall Chart FREE upon request
CIRCLE INFORM-A-GRAM KEY NO. 1014

Hardened, Tempered and Ground-from-the-Solid!



It pays to specify

ACE

DRILLS
REAMERS
BLANKS

Premium Quality
High Speed Steel,
Solid Carbide and
Carbide Tipped.

ACE DRILL SETS
Standard stock sets include Fractional, Wire and Letter size drills, packaged in convenient folding index cases.

ACE BLANK SETS
Uniformly hardened high speed steel reamer and drill blanks precision ground to new close tolerance limits available in standard Fractional, Wire and Letter series sets.

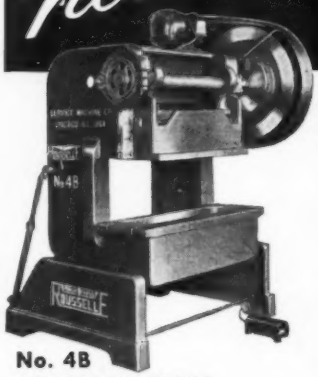
Call your local distributor today—or write Ace direct for latest catalog and price information.

ACE DRILL
Adrian, Michigan

ORIGINATORS OF "GROUND-FROM-THE-SOLID" DRILLS

CIRCLE INFORM-A-GRAM KEY NO. 1021

New **40-TON DOUBLE CRANK O.B.I. ROUSSELLE**



No. 4B
ROUSSELLE PRESS

WITH NEW ELECTRICALLY CONTROLLED AIR CLUTCH

- "Plug-in" foot and hand controls.
- Single stroke, continuous and jog selector.
- Low air consumption.
- Large die area.
- Roller bearing flywheel.
- Bronze main and crank bearings.

CHOICE OF 30 SIZES AND TYPES IN 5 TO 40-TON PRESSES

SERVICE MACHINE CO.
Mfrs. of Rousselle Presses
2310 WEST 78th STREET • CHICAGO 20, ILL.

ROUSSELLE PRESSES ARE SOLD EXCLUSIVELY THROUGH LEADING MACHINERY DEALERS

CIRCLE INFORM-A-GRAM KEY NO. 1022

KUTMORE
ADJUSTABLE
HOLLOW MILLS

- Any COMBINATION of . . . Turning . . . Tapering . . . Facing . . . Chamfering . . . Trepanning in ONE PASS.
- Exclusive MICROMETER Adjustment Feature For Rapid Set-Up.
- Area Sales engineers for your immediate Problems.

WRITE FOR CATALOG 20 TP

PRECISION STARTS HERE

CARL WIRTH & SON, INC.
1625 CLINTON AVE. NO. ROCHESTER 5, N.Y.

CIRCLE INFORM-A-GRAM KEY NO. 1023

CAMS
To Your Specifications

• • •

— Execept Screw Machine Cams —

• • •

Design Assistance Offered
KIDDE PRECISION TOOL CORPORATION
10 Locust Ave., Roseland, N. J.

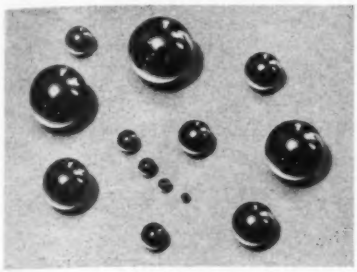
CIRCLE INFORM-A-GRAM KEY NO. 1024

MINIATURE
DRILL BUSHINGS
Hole Sizes—No. 80 to 3/32"
O.D. 3/32" to 13/64"
Lengths ¼" to 3"
.0002 Tolerance on I.D.
O.D., and Concentricity
Specials to your specifications
WRITE FOR CATALOG
PREBCO BUSHING CO.
14702 East Arrow Hwy., Baldwin Park, Cal.

CIRCLE INFORM-A-GRAM KEY NO. 1025

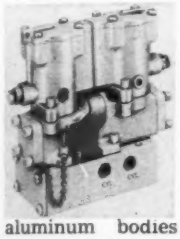
High Speed Steel Balls

Now available from stock are precision balls of high speed steel in 13 standard sizes from 1/16" to 1/2".



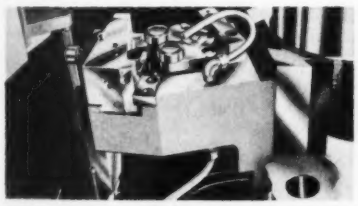
They have precision tolerances of ±0.000010" on size and are ideal for bearings and other components operating at temperatures up to 900°F. Get price list from Industrial Tectonics, Inc., Ann Arbor, Mich., or Circle Inform-A-Gram No. P36.

Improved Control Valves



This line of Speed King plug-in type 1/4" pilot-operated control valves features new one-piece solenoid pilot housings plus weight-saving aluminum bodies and sub-bases. They're designed for precise control of smaller units and come in single or double solenoid types. Valvair Corp., 454 Morgan Ave., Akron 11, Ohio, or Circle No. P37.

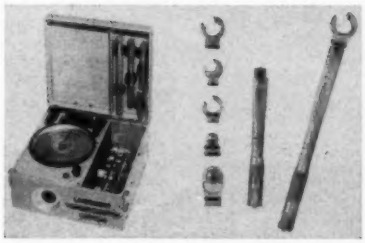
New Bar Turner



For highly efficient metal removal with exceptionally close tolerances and smooth burnished work surfaces, use the new retractable-cutter bar turner. Designed for W&S 2AB single-spindle bar automatics, it can handle bars from 1/2" to 2 3/4" dia. Automatic cutter retraction and resetting eliminates tool withdrawal marks and prolongs cutter life. The Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, or Circle Inform-A-Gram No. P38.

Torque Control System

This new torque control system consists of a newly developed torque

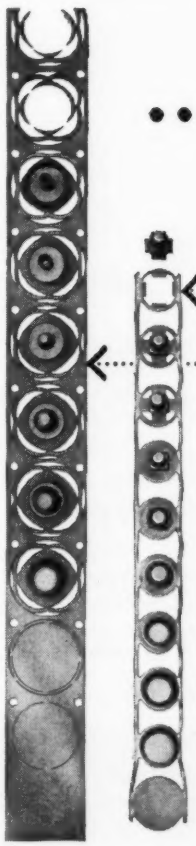


wrench with interchangeable heads, and an inexpensive portable analyzer with universal adapter for fast accurate testing and setting for wrench types and sizes from 1/4" to 3" and in torque values up to 1600 in-lbs. Richmont, Inc., 922 S. Myrtle Ave., Monrovia, Calif., or Circle Inform-A-Gram No. P39.

Coats Work Coils

Maintenance-coating of induction heating work coils is easy with Kotacoil. The sprayed coating assures longer life and offers improved efficiency and greater utility of the equipment itself. For details, contact Induction Heating Corp., Dept. PR-3, 181 Wythe Ave., Brooklyn 11, N. Y., or Circle Inform-A-Gram No. P40.

PRODUCE MORE and SAVE MORE



...with Dickerman PRESS FEEDS!

"STANDARD" DICKERMAN DIE FEED

80 strokes per minute on .030" cold rolled steel 3" wide with Dickerman 6 x 4 Die Feed.

45 strokes per minute on .030" cold rolled steel 4 1/4" wide with Dickerman 6 x 6 Die Feed.

Rugged, dependability built into every one of the 14 standard off-the-shelf feeds give 24 hour a day trouble-free performance.
At any speed the tooling will withstand, where high precision or high production are required, Dickerman Feeds pay for themselves and then go on paying dividends over and over again. Many Dickerman feeds have performed flawlessly for over 100 million strokes.

Improve your press feeding profits—send for the Dickerman "Standard" Catalog File and prices today!

Dickerman

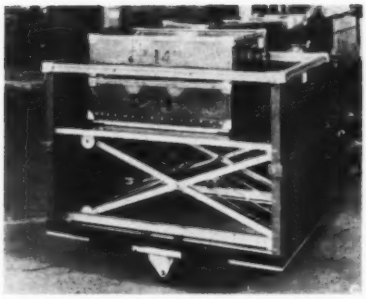
H. E. DICKERMAN MFG. CO.
321-338 Albany Street • Springfield, Mass.

CIRCLE INFORM-A-GRAM KEY NO. 103

Product News

Handy Hand Truck

With the new floating bottom feature of this new hand truck, contents of the truck are always at waist level, eliminating straining and awkward lifting. The Kennett Unilevel trucks are available for handling maximum loads of up to 450 lbs. National Vulcanized Fibre Co., 1059 Beech St., Wilmington 99, Del., or Circle Inform-A-Gram No. P41.

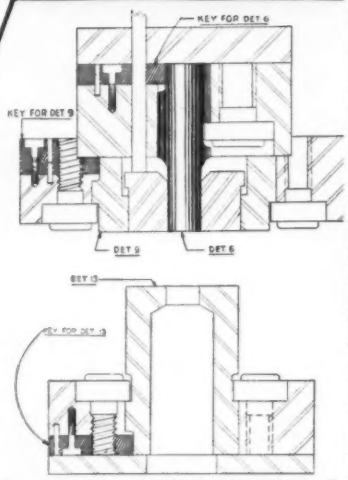


NEW
HOVIS KEY-ALIGNED DIE
THE LATEST ADDITION TO OUR STANDARD UNITS

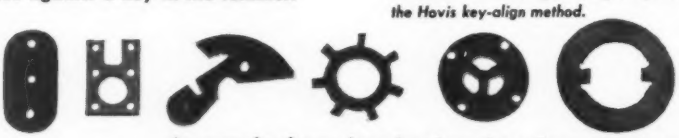
a must for irregular stampings

ELIMINATES ALL SET-UP ERRORS AND INSURES UNINTERRUPTED ACCURACY

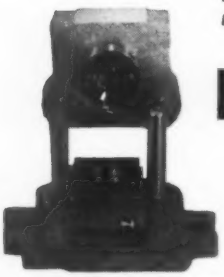
When producing irregular shaped stampings, it is important that the cutting members of the die are located in the proper radial alignment. Hovis has introduced the key-aligned die to meet this requirement . . . With the key-aligned die any press operator can install the inserts without the possibility of misalignment. This is accomplished with a flat on the insert which locates against a key in the retainer.



A section line drawing showing the principle of the Hovis key-align method.



An example of some irregular pieces these dies produce by merely purchasing special sets of parts on which we are glad to quote



Made in 6 sizes:
¾"-1½"-2½"-4"-6"-8"

HOVIS UNIVERSAL COMPOUND DIES

for producing WASHERS and SMALL STAMPINGS . . . No need to make a NEW DIE for every STAMPED PART

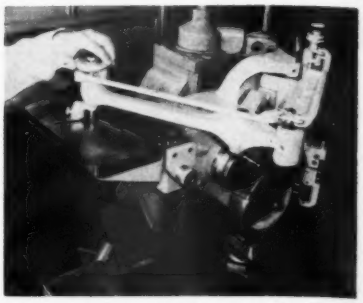
By simply removing and replacing five, small, interchangeable inserts a new part may be produced . . . This method makes possible all production including irregularly shaped pieces and shallow draws.

HOVIS SCREWLOCK COMPANY
8100 E. NINE MILE ROAD • BOX 97 • WARREN, MICHIGAN
Phone: Slocum 7-4800 Suburb of Detroit

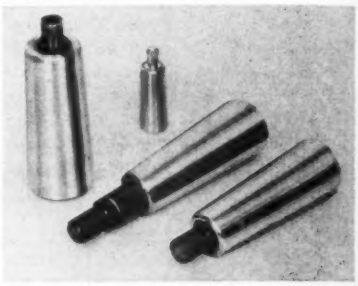
CIRCLE INFORM-A-GRAM KEY NO. 104

More Grinding Speed

A new Diaform wheel forming attachment is for toolroom surface grinders and is permanently mounted on the machine's spindle head. Model 5 is ready to form-true or re-true grinding wheels but is out of the way for grinding operations. Pratt & Whitney Co. Inc., W. Hartford, Conn., supplies information, or Circle Inform-A-Gram No. P42.



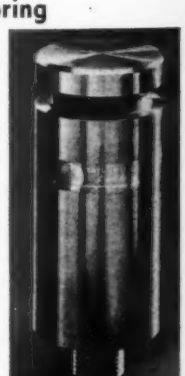
Revolving Handles



Simplify turning by attaching these revolving handles to handwheels. Made of aluminum, they feature extra long bearing surface to eliminate much of the turning friction and reduce wear. Various handle lengths are available from Jergens Tool Specialty Co., 712 E. 163rd St., Cleveland 10, or Circle Inform-A-Gram No. P43.

New Liquid Spring

This new liquid spring produces 40,000 lb force on 1/4" stroke in the self-contained package only 2½" in dia and 5" long. Model 2040 provides yieldable member on overload and thermal expansion applications. For Catalog S, write Taylor Devices, Inc., 188 Main Street, N. Tonawanda, N.Y., or Circle Inform-A-Gram No. P44.



Now Boice-Crane Brings You

AMAZING DRILL PRESS VALUES!

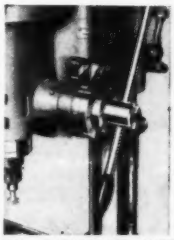
18" Rivals a 20" in Capacity & H.P.
24" Models Sensationally Out-Perform

You buy Scotch from Scotland, optical goods from Germany, perfume from France, lace from Ireland, and woolens from England because you consider them superior.

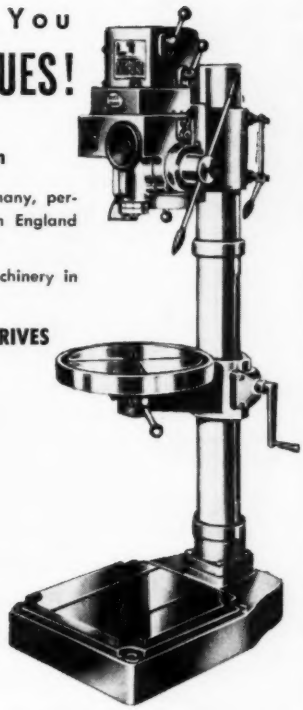
Now get the fine unhurried workmanship of Swedish machinery in drill presses made especially for Boice-Crane, U.S.A.

WITH MIGHTY CONSTANT-POWER GEARSHIFT DRIVES

GOOD-BY TO UNHANDY GUARDS, PULLEYS, BELTS TO CHANGE. Instant speed selection by gearshift on 4-speed models, plus 2-speed motors on 8-speed models. Reverse tapping switch standard on 24", optional on 18".



NEW EXCLUSIVE! POSITIVE AUTOMATIC MULTI-DEPTH STOPS. Provide 3 stops for hand-feed step or interrupted stroke drilling and counterboring.



SPINDLE • QUILL • COLUMN—Stocky, oversize, super-accurate spindle has No. 3 M.T. socket WITHIN IT and BETWEEN BEARINGS. All bearings SKF, the bottom-most a heavy duty roller bearing. Columns from 4" dia. on 18" to 5" on 24" P.F. model. All quills 2⅜". Head and Table Raisers are standard.

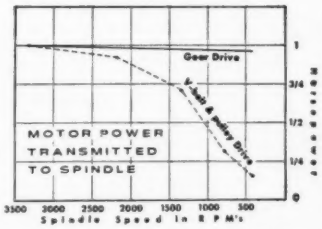
POSITIVE ALL-GEAR DRIVE—MORE POWER THAN V-BELTS. Fully enclosed precision steel and fiber gears. 9 to 11 ball bearings. 1 H.P. geared drive means 1 H.P. at ALL speeds. Contrast with the terrific power losses of V-Belts and sheaves at the low spindle speeds best suited to large twist drills.

DOWN TO EARTH PRICES

18", 1" holes max., 3-ph. plain table ..... **Just $369.50!**

24" P.F. 1¼" cap., shown, only $795.00. H.F. $575.00.

FULLY GUARANTEED—Inspection ticket certifies in .000's and .0000's the built in accuracy and critical alignments.



REPLACEMENT PARTS STOCKED TO MEET ALL FUTURE DEMANDS

SAVE UP TO 30%

BANDSAW BLADES for metal. Best Uddeholm Swedish Steel. Typical prices per 100', 3/16" and ¼"—$15.39; ⅜"—$16.27; ½"—$17.54. Prompt shipments. Guaranteed.
Dealers wanted. Free leaflet lists sizes.

Write today for additional information.

BOICE CRANE POWER TOOLS

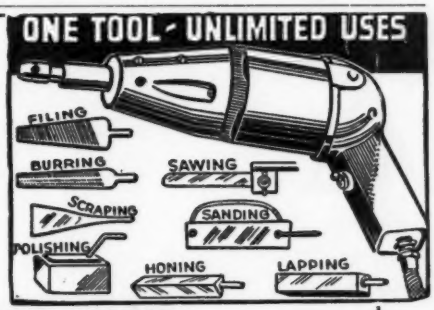
BOICE-CRANE COMPANY
963 W. CENTRAL AVENUE TOLEDO 6, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1051

STOP . . . HAND WORK

Use these Handy PORTABLE ELECTRIC RECIPROCATING TOOLS for Greater Production, Better, More Uniform Work — All with less Operator Fatigue. Fixed strokes are ⅛" or ⅜" long. Operate on 110 Volts AC-DC. Deliver 1000 PUSH-PULL strokes per minute. Try one of these tools on your next job.

Send for Descriptive Literature



ACME TOOL CORP.
75 WEST BROADWAY NEW YORK 7, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1052

New "Driving Center" Introduces Faster Machining Techniques on work Held Between Centers

Eliminates Chucks and Clamps... Permits Full End-to-End Machining... "Loads" or "Unloads" without Stopping

A new development to increase both output and accuracy, the Ideal Driving Center grips the end face of the work and so eliminates entirely the need for chucks, dogs or other bulky clamping devices.

New machining techniques and remarkable cost savings are thus made possible. Chucking time is completely eliminated and work may be machined from end to end without removal or change. Usually the machine can be loaded and unloaded without stopping, which substantially reduces wear on motors, belts, gears and clutches.

Quality of work is generally improved, because rigid direct-drive action reduces backlash and eliminates slippage. Precision indexing on gear hobbers and mills is simplified.

Preliminary machining is unnecessary; self-compensating pins grip and hold non-uniform work-ends — even odd-shaped pieces that cannot be held by other means.

Lathe or other machine operators do not have to learn difficult new methods. The Driving Centers are available in catalog models providing 63 combinations to fit maximum work diameters from ⅞" to 6⅜", in Morse tapers 2 to 6. Larger sizes may be had as "specials".

Complete details of operating principle and selection chart will be sent without obligation. Mail coupon below to

IDEAL INDUSTRIES, Inc.

IDEAL

IDEAL INDUSTRIES, Inc.
1334-K Park Ave., Sycamore, Ill.

Please send me complete engineering data and selection chart for IDEAL Driving Centers.

Name_____

Company_____

Address_____

City_____ Zone____ State_____

CIRCLE INFORM-A-GRAM KEY NO. 1053

ARMSTRONG

SET-UP and HOLD-DOWN TOOLS

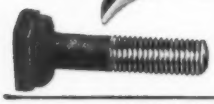
ARMSTRONG Set-up and Hold-down Tools reduce setting-up time—keep men and machines producing. Designed for use on planers, drill presses, milling machines, etc., they hold work securely and rigidly, and thereby reduce spoilage and prevent costly accidents.

Your local Armstrong Distributor carries ARMSTRONG Set-up and Hold-down tools in stock in sizes for every operation. Stop haphazard setting-up methods. Provide each of your machines with a full complement of ARMSTRONG Set-up and Hold-down Tools.

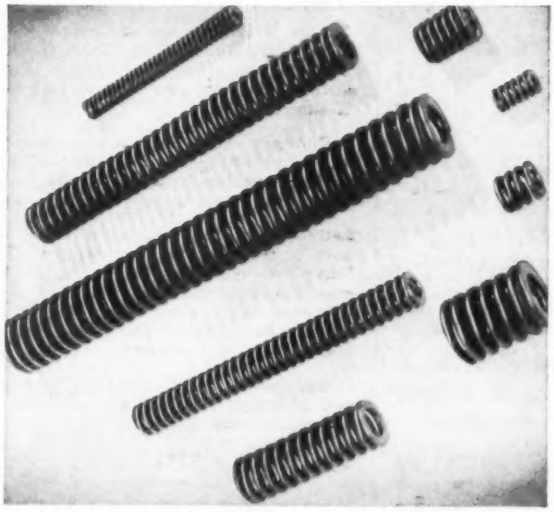
Write for circular

ARMSTRONG BROS. TOOL CO.

5220 W. Armstrong Ave., Chicago 46, U.S.A.



CIRCLE INFORM-A-GRAM KEY NO. 1061



Die Springs

Chrome vanadium die springs in stock in a wide variety of hole and rod sizes, lengths and deflections. Medium, medium-heavy, heavy duty for increased life and reduced down time. Write for list of specifications and prices, and name of nearest distributor.

Raymond Manufacturing Division

Associated Spring Corporation

Corry, Pennsylvania

5497

CIRCLE INFORM-A-GRAM KEY NO. 1062

"Specialization Creates Perfection"!

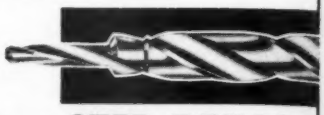
Comet® BORING TOOLS

(H. S. S. and Carbide) for Holes from 1/16" upward

Standard and Special Boring, Facing and Internal Threading Tools. Write for Data.

Bore Small Holes? Contact COMET

Comet® LOW COST High Speed Steel STEP DRILLS



Made to Your Own Specifications

PROMPT SERVICE

Write for Complete Data

COMET Tool Co.

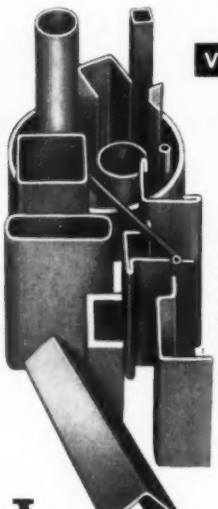
738-T2 BROADWAY NEW YORK 3, N. Y.

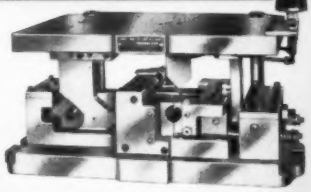
CIRCLE INFORM-A-GRAM KEY NO. 1063

SHEARS CLEAN TO ACCURATE LENGTHS

FAST!

VOGEL CUT-OFF MACHINE





With each press stroke, unit accurately cuts off tubing and shapes into lengths of ½" ±.010", or more. The ends are cut clean with a minimum of burr or distortion . . . Shearing blades make thousands of cuts before resharpening.

No. 12 unit cuts up to ¾" O.D. x 3/32" wall.

No. 2 unit cuts up to 2" O.D. x ⅛" wall.

No. 3 unit cuts up to 3" O.D. x 3/16" wall, or up to 3½" O.D. x ⅛" wall.

Odd shapes handled in sizes equivalent to unit's O.D. capacity.

VOGEL TOOL & DIE CORPORATION

1813 NORTH 32ND AVENUE, STONE PARK, ILL.

CIRCLE INFORM-A-GRAM KEY NO. 1064

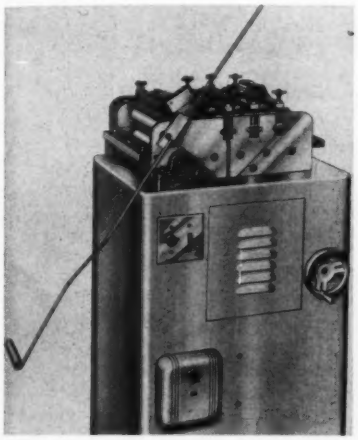
New Air Accessories

An accessory pin and bleeder valve are now available for use on

Allenair air cylinders. The accessory pin (shown) has a throw of 0.062" and can be provided at either end of any cylinder. Literature available from Allenair Corp., 255 E. 2nd St., Mineola, N.Y. P45.

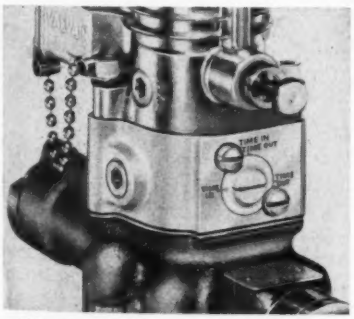
Versatile Straighteners

Six new stock straightener models are capable of 20 to 80 fpm stock feed and hold stock at 40" height.



They handle coiled stock from 4" to 10" wide and 0.020" to ⅛" thick. For details write H. E. Dickerman Mfg. Co., Springfield, Mass., or Circle Inform-A-Gram No. P46.

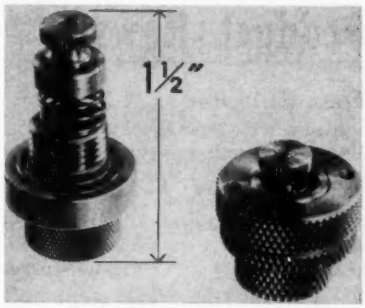
New Timing Head



Eliminate timers and relays in circuits requiring time delay in valve function by using the new universal timing sequence head for use on all Valvair Speed King and inline valves. It'll time-in, time-out, or both time-in and time-out. Delay in valve function from 0 to 30 sec is provided. Write Valvair Corp., 454 Morgan Ave., Akron, Ohio, for details, or Circle Inform-A-Gram No. P47.

Precise Flow Control

This new Micro-Flow control device incorporates an adjustment enabling pre-setting for desired rate of flow to fractions of a cubic centimeter per min. It can be used as a fixed or adjustable flow control or to calibrate other types of test equipment. Acme Industrial Co., 200 N. Laflin, Chicago 7, or Circle Inform-A-Gram No. P48.



VARIMATIC®

The SUPER SENSITIVE, SMALL-HOLE, PRECISION DRILLING MACHINE

With capacity of .004" to 5/16" in *all* drillable materials, and spindle speeds from 840 to 9300 R.P.M. infinitely variable in two speed ranges . . . *this* is the machine which the precision industries rely upon to handle the "heart-break jobs."

"for the finest work you do"

ALSO . . .

Three companion drills, each built to the same accuracy but differing in drive, speed range, and clearances, to cover the full range of special precision requirements.

AND A TAPPER . . .

with capacity from .034" x 120 to ¼" x 24 . . . and a "reserve of accuracy."

2488

You will want full information about the Hamilton Line of precision drilling and tapping machines. And we will be glad to furnish it.

Ask for our FREE BULLETIN NO. 2488

ADDRESS

THE HAMILTON TOOL COMPANY
832 South Ninth Street
HAMILTON, OHIO

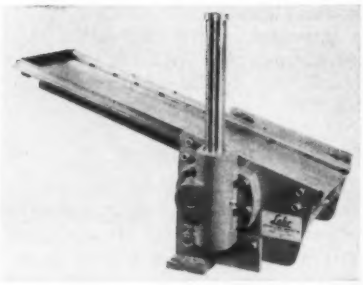
IT'S A Hamilton Tool
USE IT WITH CONFIDENCE

CIRCLE INFORM-A-GRAM KEY NO. 107

Product News

Press Unloader

A new tray-type reciprocating unloader line with variable stroke removes parts and blanks from a mechanical press. The unloaders are controlled by movement of the press ram with the tray sliding underneath the die during the up-stroke and retreating again with the part on the down-stroke. Literature is available from Lahr Machine & Tool Co., 3404 Maplewood Ave., Toledo, Ohio, or Circle No. P49.



Here's a Battery of PROFIT PRODUCING PERKINS PRESSES

For years some of the largest metal working plants in the country have used batteries of Perkins Presses to economize on space, lower production cost and ease of operation. They're the LITTLE GIANTS of the industry. Sturdy . . . Versatile . . . Economical.

Write Dept. TP-13 *for catalogs showing variety of models and complete specifications.*

Shown here is the Press Room of the Acme Chain Corp. of Holyoke, Mass., now operating 175 Perkins Presses. Before you buy, check the economical price of these long-life profit-producing Presses.

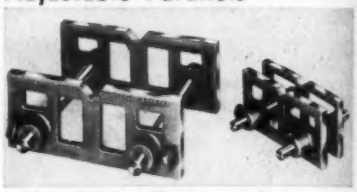
PERKINS MACHINE COMPANY
WARREN, MASS., U.S.A.

CIRCLE INFORM-A-GRAM KEY NO. 108

New Abrasive

Both resin bonded depressed center and cup wheels have been added to the Magnecoated disc line. The Magnecoating process almost positions the grit particles for greater concentration and stands them up on end to produce many more cutting edges. Write Abrasive Co. of America, 492 Main St., Ft. Lee, N. J., or Circle Inform-A-Gram No. P50.

Adjustable Parallels



Use Little Chap parallels as a complementary holding device on drill presses, arbor presses, and to support work on surface plates, machine beds, workbenches, or worktables. They can be used free or secured and can be mounted with jigs or fixtures designed for specific long run operations. They accommodate regular or irregular pieces. Write Threadwell Tap & Die Co., Greenfield, Mass., for a bulletin, or Circle Inform-A-Gram No. P51.

Light Duty Grinder

This low-cost 12½-oz light-duty turbine grinder uses a balanced design body for comfortable handling. It runs cool, blowing chips away from the work, and features automatic air shut-off when it's disconnected. Ideal for intricate hand work. Get details on Desoutter air grinder from Newage Industries, 222 York Rd., Jenkintown, Pa., or Circle Inform-A-Gram No. P52.

FOR YOUR
"SPECIAL"
MADE TO ORDER
CUTTING TOOL REQUIREMENTS
We solicit your SPECIAL REAMER and SHANK Type cutting tools. Quotations promptly given to your blueprint, sketch or other types of specifications. Write for catalog.
World Greatest Selection of Reamer Sizes
Write for Catalogue
Phone: Libertyville 2-4200
TWENTIETH CENTURY MANUFACTURING CO.
Route 176 and Bradley Road
Box 429 TP Libertyville, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 1091

Better Steel Think about Rule Dies!
Save up to 90%
FOR SHEARING, BLANKING, PUNCHING, PIERCING
YOU CAN MAKE STEEL RULE DIES FASTER, BETTER, CHEAPER WITH RICHARDS STEEL RULE DIE-MAKING EQUIPMENT!
Build steel rule dies in your own plant! Production cost and waiting time go down when Richards Equipment goes to work for you! More and more progressive manufacturers are turning to steel rule dies for faster, higher-profit work on all types and gauges of metal.
Richards' fifty years of experience as pioneer manufacturers of steel rule die-making equipment and supplies provides you with a complete service.
ELECTROMATIC SUPER DIE SAW 42" x 52" TABLE 50" JIG THROAT BUILT IN FOUR SIZES 24" 30" 50" 74" THROAT
"ATLAS" STRAIGHT STEEL RULE CUTTING MACHINE No. 3AC5
MULTIFORM HEAVY DUTY BENDER No. 4HDC PRODUCES AN INFINITE VARIETY OF BENDS USING ONE SET OF STANDARD TOOLS
WRITE TODAY! WE'LL SHOW YOU WHAT RICHARDS EQUIPMENT CAN DO FOR YOU!
J.A. Richards Company
NORTH PITCHER STREET • KALAMAZOO, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1093

just ONE DUSTKOP STOPS DUST
heavy duty unit services up to 19 MACHINES
In the complete line of Aget Dust Collectors there are sizes that will service from one to nineteen machines—large or small. Some exhaust cleaned air externally . . . others clean and recirculate air within your plant. Write for illustrated folder . . . today.
46 Standard Models—Ready to Use
AGET manufacturing company
1394 Church Street • Adrian, Michigan

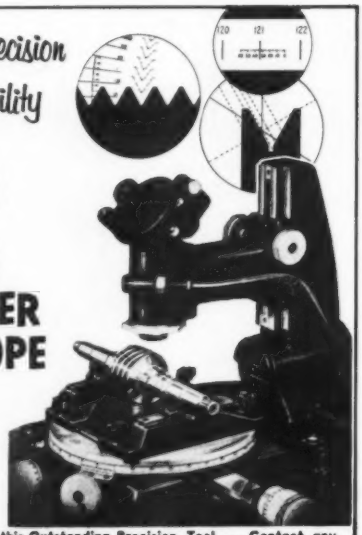
CIRCLE INFORM-A-GRAM KEY NO. 1092

THRIFTMASTER
your source for dependable
DRILLHEADS
Universal Joint Type Drillhead . . . Full Ball or Bronze Bearing Construction, Standard or Heavy Duty. From ½" minimum centers up. Capacities to ½" in Steel.
Gear Driven Eccentric Type Adjustable Drillhead . . . Enclosed, Full Ball Bearing Construction. Double Eccentric Type Adjustable Drillhead illustrated.
• We stock or can build the right drillhead for your jobs.
• Write for your free copy of the THRIFTMASTER CATALOG or phone for a rush, on-the-spot, quote.
Makers of
DORMAN AUTOMATIC REVERSE TAPPERS
Special Fixed Center Drillhead . . . Made to your requirements. Full Ball Bearing Construction.
THRIFTMASTER Products Corporation
A SUBSIDIARY OF THOMPSON INDUSTRIES, INC.
1012 N. Plum Street
Lancaster, Pa.

CIRCLE INFORM-A-GRAM KEY NO. 1094

For Highest Precision and Dependability

CARL ZEISS JENA



LARGE TOOLMAKER MICROSCOPE

6" x 2" RANGE
11" Diameter Built-in Rotary Table
Indexing Full 360°

For the Complete Story of this Outstanding Precision Tool — Contact any of our 3 "Coast to Coast" Locations or your nearest Local Distributor.

SCHERR-TUMICO

PRECISION MEASURING TOOLS AND INSTRUMENTS

Eastern Office: GEORGE SCHERR CO., INC.
200 Lafayette Street • New York 12, N. Y.

Midwest Office and Factory: TUBULAR MICROMETER CO.
St. James, Minnesota

West Coast Office: SCHERR-TUMICO CO.
3337-39 West Olympic Blvd. • Los Angeles 19, Cal.

CIRCLE INFORM-A-GRAM KEY NO. 1101

The PUNCH WITH A Punch

Items shown here are stock. Usual shipment within 48 hours of order receipt.
Specials made to your specifications.
Send to Dept. A for catalog.

RING PUNCH & DIE
INCORPORATED
Jamestown, New York

CIRCLE INFORM-A-GRAM KEY NO. 1102

Complete Metal Shop IN ONE TOOL!

FOUR TOOLS FOR THE PRICE OF ONE

1. NIBBLER
2. SHEAR
3. ROD CUTTER
4. PUNCH

Slitting and nibbling capacity 3/16" mild steel
Trimming and bar capacity 1/4" mild steel
Rod cutting capacity (round stock) 3/16", 1/4", 5/16", 3/8"
Punching capacity (depth of throat 3 3/4") 1/8" to 1/2", by 1/32"

Model 5A Handnib complete with swivel base and one punch and die only $157.50.

Send for BIG FREE 28-page catalog showing handnibs and other famous Heinrich tools.

heinrich
QUALITY TOOLS
Dept. 139-K, RACINE, WISCONSIN

CIRCLE INFORM-A-GRAM KEY NO. 1103

WHEN THE BEST FINISH IS ALL THAT WILL DO...

IT'S IN THE DESIGN!

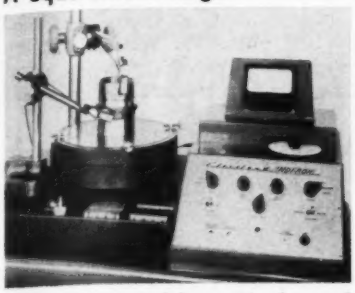
Chromed high-speed steel blades cut the dual-spiral way, in split or solid bushings or in holes with oil grooves or keyways. Even when expanded up to .080" the blades remain parallel over their full cutting area. Lempco reamer types for machine or hand use, for shallow or deep work, for long multiple alignment jobs. Specials to your needs.

WRITE TODAY FOR CATALOG & PRICES!

LEMPCO INDUSTRIAL, INC.
Bedford, Ohio
MOntrose 2-2400
MACHINE & TOOL DIVISION

CIRCLE INFORM-A-GRAM KEY NO. 1104

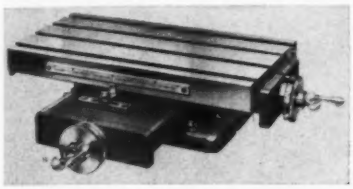
A Squareness Gage



For ultra-precision out-of-round concentricity and squareness measurements use the Indi-Ron. It can be used in laboratories and on the production floor and reduces setup time, increases part quality, and decreases production costs. Cleveland Instrument Co., Cleveland 31, or Circle Inform-A-Gram No. P53.

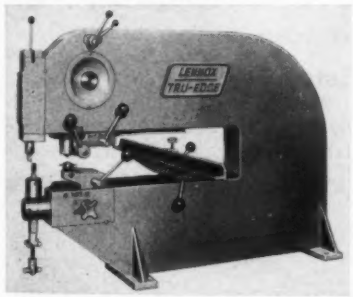
Cross-Slide Table

This light-weight low-cost precision cross-slide table is constructed with all castings of Meehanite iron.



It has an 8" x 12" surface, four tee slots with 6" scales on each slide, and dials graduated from 0.001" to 0.050" per revolution. Lawrence H. Cook, Inc., E. Providence, R. I., or Circle Inform-A-Gram No. P54.

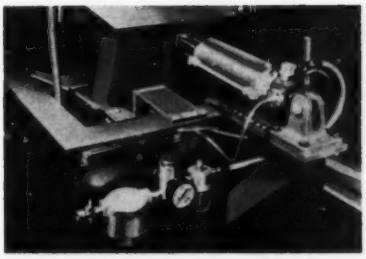
Bench Model Shear



Portability and ease of operation are features of the new bench type shearing, forming, and piercing machine. Model TE-100 has an edge-cutting capacity of up to 12 ga in mild steel plate and 16 ga in stainless steel. Lennox Tool & Machine Builders, Lima, Ohio, or Circle Inform-A-Gram No. P55.

Feeding Unit

A pneumatic cylinder system for automatic feeding and ejecting has been introduced for the Promacut



saw. The uniform rate of feed reduces blade wear and prolongs its life. Production Machinery, Inc., P. O. Box 322, Oakton Sta., Des Plaines, Ill., or Circle No. P56.

Chain Pipe Tongs

New heat-treated flat link chains are a feature of the chain pipe tongs. A 40% increase in strength extends chain life and tong performance. J. H. Williams and Co., 400 Vulcan St., Buffalo 7, N. Y., or Circle Inform-A-Gram No. P57.

Both NEW *and* DIFFERENT SHELDON 15" PRECISION LATHES

NEW

New. Revolutionary double-box Headstock (Pat. Pend.)
New. "WORK-HOLDING ONLY" Spindle.
New. Single-Shift Back Gear Lever on Headstock.
New. Headstock and Apron running in oil.
New. 1½" Hole through Spindle.
New. 60-pitch Gear Box with built-in Lead Screw Reverse.
New. Amazing LOW PRICE.

DIFFERENT

Different. Spindle rigidly held in two large "Zero Precision tapered roller bearings arranged in box-type design.
Different. Electrical switches and push-button stations fully enclosed in built-in well in headstock.
Different. Two independent clutches in apron for selecting power feeds.
Different. Cam-action tailstock clamp for rapid release and instant locking of tailstock.
Different. Triple, cogged, V-belt outboard drive—eliminates intermediate shafts—delivers more power to spindle.

This is an all new lathe that bridges the gap between conventional belt driven and geared head lathes. It combines the capacity and power of a geared head with the economy and flexibility of a belt driven lathe. Available with 5', 6' and 8' bed lengths providing 31", 42" and 66" center distances.

Send in Coupon for full Information ↓

SHELDON MACHINE CO., INC., 4235 No. Knox Ave., Chicago 41, U.S.A.

Gentlemen: Please send me information on items checked.

( ) The NEW and DIFFERENT SHELDON 15" Lathes ( ) 13" Lathes
( ) Sheldon ( ) 10", ( ) 11" ( ) 12" Lathes
( ) 11" and 13" Variable Speed Lathes
( ) High Speed Turret Lathes
( ) Sebastian 13" and 15' Geared Head Lathes
( ) Horizontal Milling Machine
( ) Sheldon 12" Shaper
( ) Name of Local Dealer
( ) Have representative Call

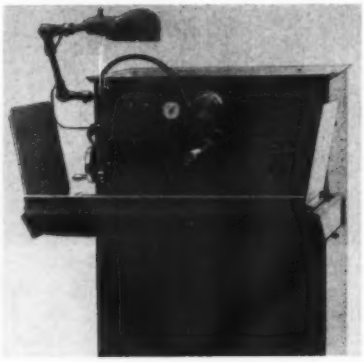
Name_____ Title_____
Company Name_____
Street Address_____ ☐ Company ☐ Home
City_____ State_____

CIRCLE INFORM-A-GRAM KEY NO. 111

Product News

Versatile Honing Machine

Production runs, toolroom work, and salvage operations can be handled by this new honing machine. Model J2 provides infinitely variable spindle speeds from 225 to 525 rpm, or an optional range of 450 to 1050 rpm. Superior Hone Corp., 1619 Elreno St., Elkhart, Ind., or Circle Inform-A-Gram No. P58.



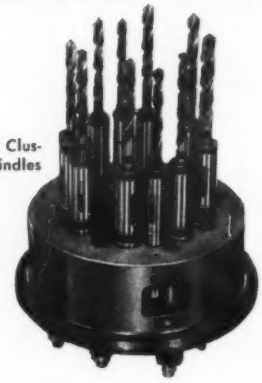
WISCONSIN multiple-spindle *Convertible* type head for drilling, tapping, spot facing, counterboring

Master Drive Head with Pick-off Gears.

If you have found that *convertible type heads* fit into your production program most effectively, you will want to profit by the experience of the WISCONSIN engineering staff in designing and building heads of this type.

WISCONSIN designs and builds all of the popular and widely used types of drill heads: Standard Multiple-Spindle Adjustable drilling and tapping heads; Fixed Spindle drilling and tapping heads; Rotating Heads; Bracket-Type Universal Joint Drill Heads and special machinery.

Cluster Box Housing showing Hole Pattern. Can be furnished with round, square or rectangular positioning.



Multiple-Splindle Cluster Plate with Spindles and Idler Gears.

Slip-Type Spindle with Idler Gears used in all convertible-type heads.

CONSULT OUR FIELD ENGINEERS OR WRITE —

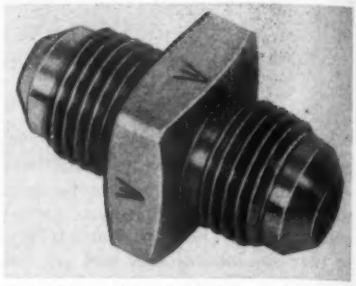
WISCONSIN DRILL HEAD CO.

4985 NORTH 124TH STREET • BUTLER, WISCONSIN

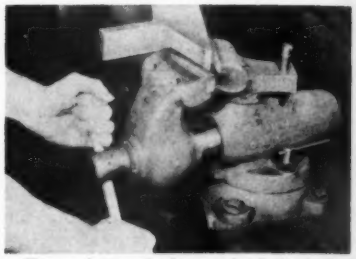
CIRCLE INFORM-A-GRAM KEY NO. 112

Versatile Check Valve

Applicable to all types of hydraulic and pneumatic systems, Quality Seal check valves are very small and light in weight. They're designed to allow full flow at operating pressures up to 3000 psi with minimum pressure drop, and to provide quick opening and positive closing. Quality Control Corp., 7315 W. Wilson Ave., Chicago 31, or Circle Inform-A-Gram No. P59.



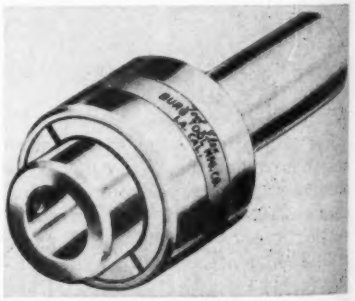
Holds Tapered Workpieces



Two sizes of the swivel jaw vise are now available. They're designed to hold tapered or irregularly shaped workpieces, and are available in 3½", 4½", and 6" jaw widths. Get brochure from Wilton Tool Mfg. Co., Inc., Schiller Park, Ill., or Circle Inform-A-Gram No. P60.

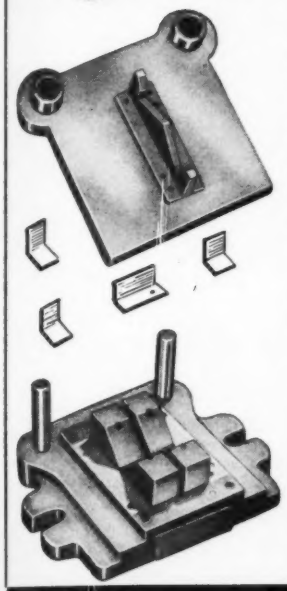
Setup Tool

The Tool-Flex full floating toolholders automatically compensate for parallel and angular machine spindle misalignment. Thus there are faster setups and more accurate machined parts. Used on boring, drilling, spot-facing, reaming, and tapping machines. Burgmaster Corp., 15001 S. Figueroa St., Gardena, Calif., or Circle No. P61.



Punches and Dies

Angle Iron Cut Off Die



No. 18, cut off die, for 2" x 2" x ¼" and lighter angles. Mounted in leader pin die set. Fits 'most all makes of 25-ton and larger presses. Simple shearing action insures straight, clean cut WITHOUT DISTORTION. Another of the many different kinds of punches and dies in stock or made to order for foot, hand or power operation. Also adaptors and die shoes to convert your press. Each precision-made.

27 *years of serving your punch and die requirements*

What are your punch and die needs? Consult us about your problems. Prompt service on "specials" made to your order.

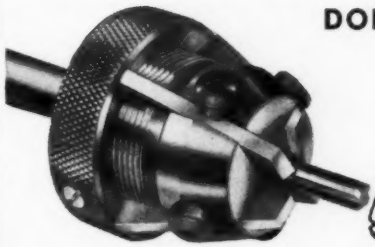
SEND FOR FREE CATALOG NO. 157 AF, illustrating our standard punches and dies and complete line of modern sheet metal fabricating equipment. **NET PRICES SHOWN.**

WARD Machinery Co. 564 West Washington **Chicago 6**

CIRCLE INFORM-A-GRAM KEY NO. 1131

TUBE DEBURRING TOOL

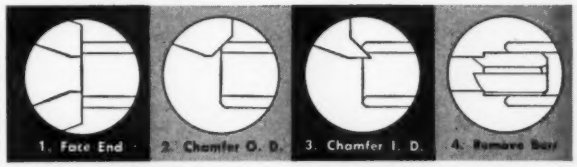
DOES 4 JOBS AT ONCE



ROUGH END . . .

BRASS • COPPER
STEEL • ALUMINUM

. . . TO FINISHED END



- Replaceable cutters
- Replaceable pilot reamers
- Adjustable for size control
- Easily reground in your plant

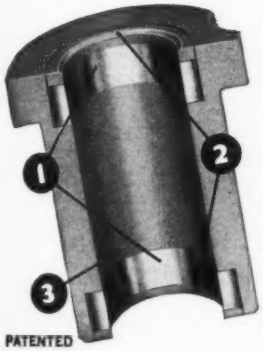
Standard sizes for 3/16" to 1-1/4" tubing.

Write for Bulletin 46P

GENESEE MANUFACTURING COMPANY
566 HOLLENBECK ST. • ROCHESTER 21, N. Y.
Adjustable Hollow Mills · Facing and Counterboring Tools · Special Production Tools
Tube Deburring Tools · Since 1908

CIRCLE INFORM-A-GRAM KEY NO. 1133

Does the Job of Solid Carbide



PATENTED

1. Tungsten carbide rings at the points of wear; 2. Steel rings protect drills and carbide; 3. Special hardened alloy steel body.

...COSTS LESS!

There in a nut shell is the story of MEYCO carbide inserted drill jig bushings! Does everything a solid carbide bushing will do at less cost: lasts almost as long; increases life of drills and jigs; greater accuracy—longer; saves man-hours and machine down-time! All this spells high production at a lower cost. For over a decade, carbide inserted drill jig bushings have been saving money on long production runs for cost conscious customers.

Write for full details—
ask for new Bushing Catalog No. 41

W. F. MEYERS CO., INC., BEDFORD, IND.

CIRCLE INFORM-A-GRAM KEY NO. 1132

LepeL

HIGH FREQUENCY *Induction* HEATING

HARDENING
SOLDERING
ANNEALING
MELTING
BRAZING

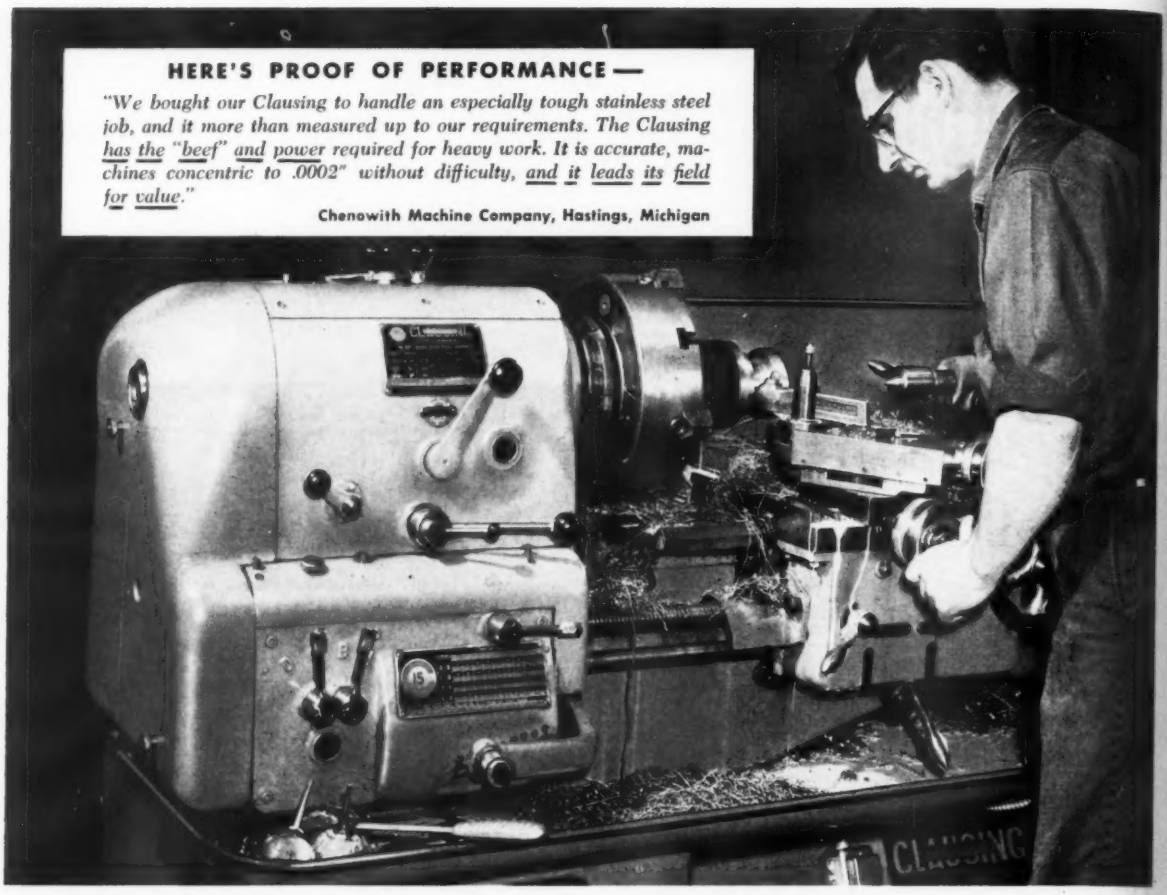
LEPEL Electronic Tube
GENERATORS —1 KW; 2½ KW, 5 KW; 10 KW; 20 KW; 30 KW; 50 KW; 75 KW; 100 KW.
LEPEL Spark Gap Converters
2 KW; 4 KW; 7½ KW; 15 KW; 30 KW.

WRITE FOR THE NEW LEPEL CATALOG . . . 36 illustrated pages packed with valuable information.

All Lepel equipment is certified to comply with the requirements of the Federal Communications Commission.

LEPEL HIGH FREQUENCY LABORATORIES, INC.
55th STREET and 37th AVENUE, WOODSIDE 77, NEW YORK CITY, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1134


HERE'S PROOF OF PERFORMANCE—
"We bought our Clausing to handle an especially tough stainless steel job, and it more than measured up to our requirements. The Clausing has the "beef" and power required for heavy work. It is accurate, machines concentric to .0002" without difficulty, and it leads its field for value."
Chenowith Machine Company, Hastings, Michigan
CLAUSING

Performance records PROVE CLAUSING COLCHESTER LATHES'

Superior Construction . . . Greater Value

Clausing geared-head lathes do lead their field in capacity, performance and value. Here's why:

They're bigger in capacity than other lathes in their class. Larger spindles, larger thru-hole capacity, larger bearings for heavier work. 17" lathe spindle, for example, has $3\frac{1}{16}$" thru hole – 15" lathe, $2\frac{1}{16}$" hole – 13", $1\frac{9}{16}$" hole.

Have heavy-duty construction. Massively built throughout. Bed ways are induction hardened. Gears in head and quick-change box run in bath of oil. Power feeds are taken from separate feed rod, lead screw is used for thread cutting only. Spindles are high-tensile steel.

Built for precision performance – to American standards of toolroom lathe accuracy. Have Gamet Micron tapered roller bearings with oil flow lubrication – the most advanced and accurate bearings known to industry.

Each is an outstanding value. 13" cabinet base models, including motor and controls, start at $2302; 15" cabinet base at $3221; 17" at $5070. You owe it to yourself to investigate before investing in *any* lathe.

Lathe Capacities: 17" lathe: 54" and 75" centers, 28" swing in gap; 15" lathe: 30" and 48" centers, 24" swing in gap; 13" lathe: 24" and 36" centers, 18" swing in gap.

Write for Free Literature

CLAUSING

CLAUSING DIVISION
ATLAS PRESS COMPANY
11-115 N. PITCHER ST. • KALAMAZOO, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 114

READER SERVICE CARD NOVEMBER 1959 ISSUE

Do Not Use This Card After Jan. 31, 1960

INFORM-A-GRAM

TOOLING & PRODUCTION: Please have information on items circled sent to me.

YOUR NAME _____ YOUR TITLE _____
(Please Print or Typewrite)

COMPANY NAME _____

COMPANY ADDRESS _____

CITY _____ ZONE _____ STATE _____

Is this issue of Tooling & Production Magazine addressed to you? Yes ☐ No ☐

(Please use only one of these INFORM-A-GRAM cards for yourself and let one of your associates use the other).

ADVERTISEMENTS

2	17	34	69	89	131	915	972	1051	1131	1202	1282
3	18	36	70	96	132	916	973	1052	1132	1211	1291
4	19	53	71	99	781	931	981	1053	1133	1212	1292
5	21	54	72	100	782	932	982	1061	1134	1221	1293
6	22	55	73	103	783	933	983	1062	1161	1222	1294
7	23	56	74	104	821	934	984	1063	1162	1231	1301
8	24	57	75	107	822	941	1011	1064	1163	1232	1302
9	25	58	76	108	901	942	1012	1091	1164	1233	
10	26	59	77	111	902	943	1013	1092	1165	1261	
11	27	61	79	112	903	951	1014	1093	1166	1262	
12	28	62	80	114	904	952	1021	1094	1181	1271	
13	29	63	81	115	911	953	1022	1101	1182	1272	
14	30	64	83	117	912	954	1023	1102	1183	1273	
15	31	67	84	119	913	955	1024	1103	1184	1274	
16	32	68	85	125	914	971	1025	1104	1201	1281	

EDITORIAL ITEMS

A1	C15	C30	C45	P13	P28	P43	P58	P73
C1	C16	C31	C46	P14	P29	P44	P59	P74
C2	C17	C32	C47	P15	P30	P45	P60	P75
C3	C18	C33	P1	P16	P31	P46	P61	P76
C4	C19	C34	P2	P17	P32	P47	P62	P77
C5	C20	C35	P3	P18	P33	P48	P63	P78
C6	C21	C36	P4	P19	P34	P49	P64	P79
C7	C22	C37	P5	P20	P35	P50	P65	
C8	C23	C38	P6	P21	P36	P51	P66	
C9	C24	C39	P7	P22	P37	P52	P67	
C10	C25	C40	P8	P23	P38	P53	P68	
C11	C26	C41	P9	P24	P39	P54	P69	
C12	C27	C42	P10	P25	P40	P55	P70	
C13	C28	C43	P11	P26	P41	P56	P71	
C14	C29	C44	P12	P27	P42	P57	P72	

Which article in this issue was of most interest to you? _____

THESE INFORM-A-GRAM CARDS are for the convenience of TOOLING & PRODUCTION readers who, we know, rarely have stenographic help at their beck-and-call while reading. To get further information concerning selected items featured—all one needs is an INFORM-A-GRAM card and a pencil or pen to circle the numbers of the items wanted. If there is no identifying number, use the page number.

Our reader service department is handling over 100,000 reader inquiries per year, and it is essential that the blanks at the top of each card be filled in accurately and completely. Please use only one of these INFORM-A-GRAM cards for yourself and let one of your associates use the other.

READER SERVICE CARD NOVEMBER 1959 ISSUE

Do Not Use This Card After Jan. 31, 1960

INFORM-A-GRAM

TOOLING & PRODUCTION: Please have information on items circled sent to me.

YOUR NAME _____ YOUR TITLE _____
(Please Print or Typewrite)

COMPANY NAME _____

COMPANY ADDRESS _____

CITY _____ ZONE _____ STATE _____

Is this issue of Tooling & Production Magazine addressed to you? Yes ☐ No ☐

(Please use only one of these INFORM-A-GRAM cards for yourself and let one of your associates use the other).

ADVERTISEMENTS

2	17	34	69	89	131	915	972	1051	1131	1202	1282
3	18	36	70	96	132	916	973	1052	1132	1211	1291
4	19	53	71	99	781	931	981	1053	1133	1212	1292
5	21	54	72	100	782	932	982	1061	1134	1221	1293
6	22	55	73	103	783	933	983	1062	1161	1222	1294
7	23	56	74	104	821	934	984	1063	1162	1231	1301
8	24	57	75	107	822	941	1011	1064	1163	1232	1302
9	25	58	76	108	901	942	1012	1091	1164	1233	
10	26	59	77	111	902	943	1013	1092	1165	1261	
11	27	61	79	112	903	951	1014	1093	1166	1262	
12	28	62	80	114	904	952	1021	1094	1181	1271	
13	29	63	81	115	911	953	1022	1101	1182	1272	
14	30	64	83	117	912	954	1023	1102	1183	1273	
15	31	67	84	119	913	955	1024	1103	1184	1274	
16	32	68	85	125	914	971	1025	1104	1201	1281	

EDITORIAL ITEMS

A1	C15	C30	C45	P13	P28	P43	P58	P73
C1	C16	C31	C46	P14	P29	P44	P59	P74
C2	C17	C32	C47	P15	P30	P45	P60	P75
C3	C18	C33	P1	P16	P31	P46	P61	P76
C4	C19	C34	P2	P17	P32	P47	P62	P77
C5	C20	C35	P3	P18	P33	P48	P63	P78
C6	C21	C36	P4	P19	P34	P49	P64	P79
C7	C22	C37	P5	P20	P35	P50	P65	
C8	C23	C38	P6	P21	P36	P51	P66	
C9	C24	C39	P7	P22	P37	P52	P67	
C10	C25	C40	P8	P23	P38	P53	P68	
C11	C26	C41	P9	P24	P39	P54	P69	
C12	C27	C42	P10	P25	P40	P55	P70	
C13	C28	C43	P11	P26	P41	P56	P71	
C14	C29	C44	P12	P27	P42	P57	P72	

Which article in this issue was of most interest to you? _____

Postage Will Be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD

FIRST CLASS PERMIT NO. 7579, CLEVELAND, OHIO

TOOLING & PRODUCTION MAGAZINE

P. O. BOX 3505

CLEVELAND 18, OHIO

Postage Will Be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD

FIRST CLASS PERMIT NO. 7579, CLEVELAND, OHIO

TOOLING & PRODUCTION MAGAZINE

P. O. BOX 3505

CLEVELAND 18, OHIO

***Experience**—the added alloy in **Allegheny Ludlum** tool steels*

Careful addition of sulfur to melt guarantees typical sulfide distribution, as shown in photomicrograph of longitudinal specimen of EZ MACHINING tool steel.

Sulfur addition to melt held to narrow range in Allegheny Ludlum's EZ MACHINING GRADES

Uniform, finely-distributed sulfides mean uniform machining, uniform high finish, uniform long tool life order after order

Adding sulfur, actually an impurity, to a tool steel melt to make it free-machining must be done with care and precision. That's why Allegheny Ludlum maintains an extremely close average range in adding sulfur to its EZ MACHINING grades. But mere range, however narrow, is not enough. A-L has developed special techniques in adding sulfur and nucleating agents to produce the uniform, finely-distributed sulfides that characterize good free-machining tool steels.

A-L's extra care means you can standardize your machining operations from piece to piece and order to order. This reproducibility is reflected in uniform *machining;* uniform *high finish;* uniform *long tool life.*

For example, in the production of hobs these machining properties in Allegheny Ludlum's EZ MACHINING steels minimize the costly "backing off" operation for back clearance of multiple teeth, eliminating complicated extra heat treatment. Lower residual stresses are set up, because the steel has a lower resistance to the cutting action. Naturally, hobbing is only one of the situations where these free-machining characteristics can benefit you.

Allegheny Ludlum stocks a complete line of tool steel sizes and grades. Call your nearest A-L representative; you'll get quick service and counsel on such problems as heat treating, machining, grade selection, etc. Or write for A-L's publication list which gives full data on the more than 125 technical publications offered. They'll make your job easier. *ALLEGHENY LUDLUM STEEL CORPORATION, Oliver Building, Pittsburgh 22, Pa. Address Dept. TP 23*

7229

ALLEGHENY LUDLUM

Tool Steel warehouse stocks throughout the country... Check the yellow pages

every grade of tool steel... every help in using it

CIRCLE INFORM-A-GRAM KEY NO. 115

You Need an Extra Hand Now to Speed Up Production!

HEIMANN TRANSFER SCREW SETS

Here is the faster, more precise way of transferring open and blind screw holes—make savings in "wage-dollars-per hour" of your expensive hands on every job. A die-and-tool maker's tool with many other applications for die makers and machinists. A set of 6 Hardened Screws nested in combination holder and wrench —no other tools needed. Get more work now—save money too!

HEIMANN MFG., CO. • URBANA, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1161

SPELLMACO SPOTTERS

A matched set of transfer punches for toolmakers, machinists and tool cribs.

Used for transferring location of threaded, drilled and reamed holes, slugs, blanks, etc.

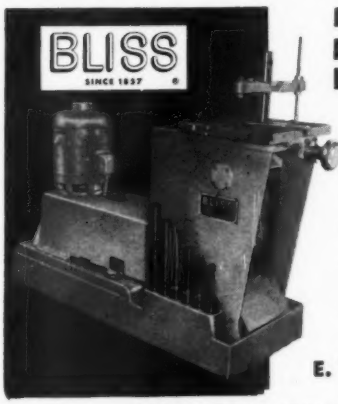
Precision made of finest tool steel carefully heat treated and tempered for long life. .0025 undersize to facilitate use—black oxide finish.

Set No. 3-17: 28 punches with indexed stand — sizes 3/32" to ½" by 1/64" plus handy 17/32" size—length 4⅞". PRICE only $17.90

Single sizes available.

R. L. SPELLMAN CO. • Urbana, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 1162



low cost HYDRAULIC KEYSEATER

cuts standard, tapered keyways ¼" to 2" wide

- fast set-up—saves time and money
- low cost operation-uses standard tool bits
- heavy-duty hydraulic circuit—assures accurate keyways
- compact, 21" x 61"—no special foundation

Send for Bulletin 34

E. W. BLISS COMPANY
CANTON, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1163

The Inform-A-Gram card which follows page 114 is for your convenience in making inquiries about advertised Products and Editorial items.

Make 3 hammers AT ONCE!

It's the NEW, easy, economical, quick way to mold your own lead hammers on a production basis with "SHUR-GRIP" handles and this COOK production mold.

COMPLETE LEAD HAMMER SERVICE

Write for circular and prices

COOK'S LEAD HAMMER SERVICE
48 MASSASOIT AVENUE, EAST PROVIDENCE 14, R. I.

CIRCLE INFORM-A-GRAM KEY NO. 1164

LITTELL COIL CRADLES

Plain and Motor Driven **1 and 2-ton capacities**

TODAY'S ORDER SHIPS TOMORROW!

COIL CAPACITIES 2,000 to 4,000 pound coils
8" to 24" maximum widths
45" maximum O.D.

Standard motor driven Littell coil cradles feed 600 inches of stock per minute. Also built with Variable Speed Drives for infinite feed range of 100" to 600" per minute.

F. J. LITTELL MACHINE CO.

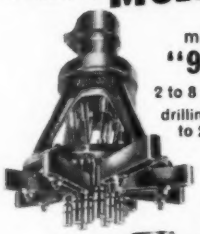
SERVING USERS OF COIL STOCK
Branches: Detroit Cleveland

Write for Catalog "B"

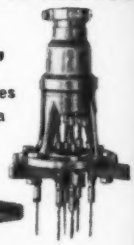
4197 N. Ravenswood Ave., Chicago 13, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 1165

For LOW COST Hole Production Pick a MULTI-DRILL® to Fit the Job



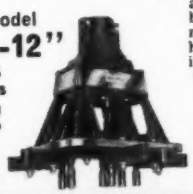
model "900"
2 to 8 spindles
drilling area to 22½"



model "500"
2 to 6 spindles
drilling area to 18½"

model "3-22"
2 to 15 spindles
drilling area to 35½"

model "400"
2, 3 or 4 spindles
drilling area 3¾"



model "8-12"
2 to 15 spindles
drilling area to 25½" x 21½"

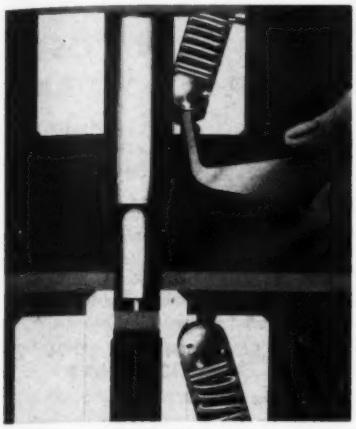
Commander MULTI-DRILLS—adjustable multiple spindle drill press attachments—are sold and serviced by a nation-wide network of Commander Distributors—experienced, helpful specialists in solving drilling and tapping problems. Write for the name of your nearest Distributor and the complete Commander Production Tool Catalog which contains full details on every MULTI-DRILL and many other production drilling and tapping tools.

Commander MFG. CO.
4228 W. Kinzie Street • Chicago 24, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 1166

Slug-Shedder Punch

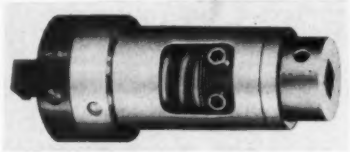
Cut expensive repairs, downtime, and lost production using these Slug-Shedder punches. With their special built-in springs they effectively



eliminate slug-pulling in any die regardless of material or thickness being pierced. Ask Richard Brothers Punch Div'n, Allied Products Corp., 26500 Capitol Ave., Detroit 39, for information on sizes, or Circle Inform-A-Gram No. P62.

Versatile Torque Driver

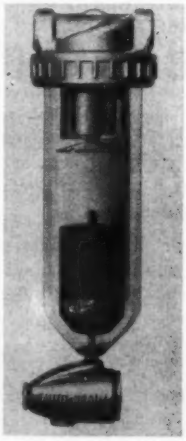
The new TitanTorker is designed to make controlled power torque available for various uses. An audi-



ble signal is given when desired torque is reached and adjustment can easily be made for more or less torque. Get information from Titan Tool Co., Main St., Fairview, Pa., or Circle Inform-A-Gram No. P63.

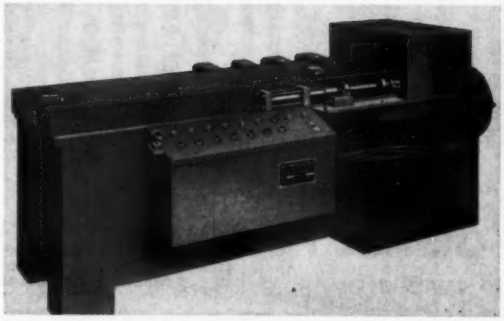
Air Line Filter

Here's an air line filter that drains automatically. Air is let into the pilot valve chamber when liquid accumulates, opening a scavenger valve, and the liquid is blown out the drain opening. Watts Regulator Co., Industrial Div'n, 10 Embankment Rd., Lawrence, Mass., or Circle No. P64.



Automatic Circular Saw

Designed for high production cutting of aluminum and brass extrusions, bar stock and tubing, Model V-4 circular saw has a 4" x 4" capacity. It can be set up to feed automatically by holes or other characteristics stamped into the materials. Write W. F. Wells & Sons, Three Rivers, Mich., P65.



Buck
chuck
teamed up *right*
really pays off

Landis Universal at Angelus Sanitary Can Machine Co., Los Angeles, California

Take a *good* machine . . . complement it with a Buck chuck . . . and *you make money every time!*

The job above was grinding O.D. and I.D. of tool steel bushings. The flexibility of the machine plus the precision of the Buck cuts grinding time in half! Tolerance of ± .0005" was no problem for the buck.

Make any comparison you want . . . there is no other chuck with the quick, adjustable, precision capabilities of Buck Ajust-Tru® chucks. Send for a catalog—see why "It pays to chuck with Buck."

Makers of Scroll, Power, Dust Proof, Independent Chucks.

BUCK TOOL COMPANY
1118 SCHIPPERS LANE • KALAMAZOO, MICH.
CIRCLE INFORM-A-GRAM KEY NO. 117

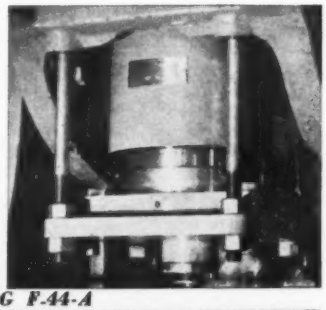
DIE CUSHIONS

by Dayton Rogers

FOR ALL PUNCH PRESSES

to assure accurate working pressure on all dies

- Single installations from 1 ton to multiple installations of unlimited capacity, standard or designed on the job.
- Quotations on request.
- Best possible delivery.



11 Ton Full Universal Pneumatic Die Cushion Installed on inclinable→ Press.

WRITE FOR CATALOG F-44-A

DAYTON ROGERS *Manufacturing Company*

MINNEAPOLIS 7B, MINNESOTA

CIRCLE INFORM-A-GRAM KEY NO. 1181

GAGE COMPANY *Deep-Etch*

PRECISION PLASTIC • NON-BREAKABLE

COMPARATOR SCALES

Highly accurate and designed for making quick measurements at scale on projectors and comparators without any movement of machine or work.

Supplied on Gage Company Precision Plastic . . . a sturdy, non-breakable material of constant stability, .125 in thickness.

Unexcelled as a tool for use in drafting and engineering scale layouts for use on comparators.

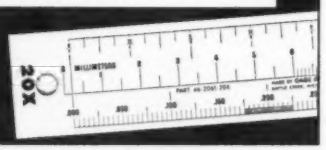
Available in all standard magnifications and in several lengths. Various styles for all applications.

WRITE FOR BULLETIN NO. 58-70

GAGE COMPANY

• • • BOX 1080

Battle Creek, Michigan



CIRCLE INFORM-A-GRAM KEY NO. 1182

Raymac SOLID CARBIDE GRINDING TOOLS

FIRST STEP TO LOW COST BETTER WORK

When it comes to cutting labor and tool costs there is nothing like Raymac Solid Carbide Tools.

Raymac grinding tools reduce finishing time—small diameter holes can be ground without bell mouthing or surface crazing—finishes are in low micro inch range.

SOLID CARBIDE TOOL RECONDITIONING

The Second Step—keep your tools sharp—in good cutting condition. Let our engineers help set up an efficient reconditioning program for high production with low inventory of tools.

Get Details Today!

Raymac

DIVISION OF DEXCO CORP.

15490 Dale Ave., Detroit 23, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 1183

complete protection against dirt, grime and wear for any moving part with

ELASTICONE® COVERS

Plan ahead . . . specify Elasticones by size and number on your next drawing—get automatic protection for shafts, bushings, lead screws, guide pins or hydraulic rams—wherever precision and lubrication must be preserved.

Elasticones are spirally wound flat alloy steel cones available* in standard sizes for immediate delivery. Write for complete information and new data sheet '58.

CENTRAL *Safety Equipment Co.*

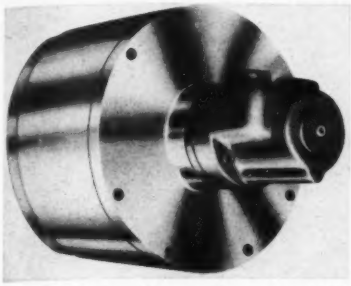
6603 Marsden Street Philadelphia 35, Pa.

Distributors in principal cities

CIRCLE INFORM-A-GRAM KEY NO. 1184

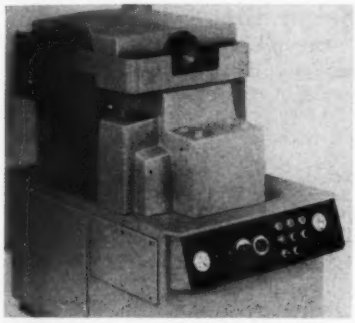
Fast Air Cylinder

Designed for use at speeds up to 3600 rpm, this new Model RM rotating air cylinder has an aluminum alloy housing and covers, and less-



ened flywheel effect reduces the load on the machine's motor, clutch, and brake. It's available in 3″ to 16″ bore sizes and all models have extra long stroke. The S-P Mfg. Co., 30201 Aurora Rd., Solon, Ohio, or Circle Inform-A-Gram No. P66.

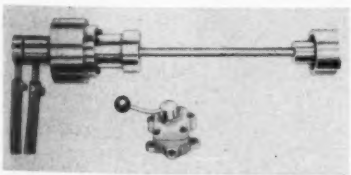
Automatic Drill Pointer



Helical and conventional points can be produced by this new precision drill pointer. Model 100 Winslo-Matic is used for pointing drills from 0.032″ thru 1.50″ dia. Drill points are concentric within 0.0002″. Winslow Product Engineering Corp., 47 St. Joseph St., Arcadia, Calif., or Circle Inform-A-Gram No. P67.

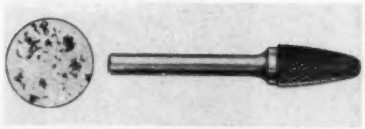
For Air Chucking

With the new Skinner power chucking unit it is now possible to convert Models 2 and 2G B&S auto-



matic screw machines to air chucking. Chucking of cold drawn and odd shaped parts at higher speeds and at less cost is possible. Write to Skinner Chuck Co., New Britain, Conn., for details, or Circle Inform-A-Gram No. P68.

Faster Deburring



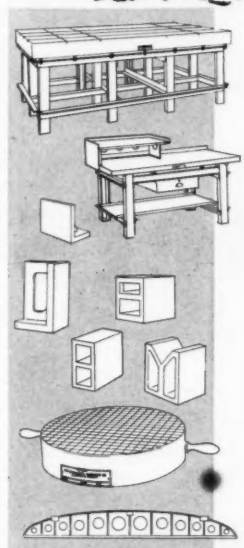
A new type cut for burrs has a tooth form that has three cutting edges. The Dia-Mo cut practically eliminates burr climb and increases cutting action and stock removal, reducing operator fatigue and giving longer tool life. The Atrax Co., 240 Day St., Newington 11, Conn., or Circle Inform-A-Gram No. P69.

Miniature Laps

Eight smaller sizes of helical-slot round hole laps are now available to lap holes 1/16″ to 11/64″ in increments of 64ths. Special decimal in-between diameters are also available from American Lap Co., 20184 Sherwood, Detroit 34, or Circle Inform-A-Gram No. P70.

need to hold CLOSER TOLERANCES?

HERE ARE OVER
300 AIDS to
PRECISION
PRODUCTION



More than 300 different items are available in the Challenge Precision Surface Equipment line to help you maintain close control of accuracy in your tooling, manufacturing assembly and inspection operations.

These include both Granite and Meehanite Surface Plates of all types and sizes. Also Meehanite Angle Plates, V-Block, and many other items of precision surface equipment. In addition, many special sizes and types can be made-to-order.

Take this important step toward cutting costs and minimizing rejects. Get information on Challenge Precision Surface Equipment to improve your operations.

SEND FOR THIS HANDY FREE CATALOG covering description and prices on all standard items.

THE CHALLENGE MACHINERY CO.
GRAND HAVEN, MICHIGAN

SE-122

challenge
PRECISION SURFACES
for LAYOUT • INSPECTION • ASSEMBLY

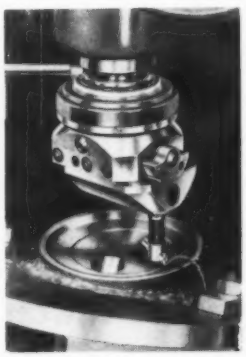
Challenge TRADE-MARK ®

CIRCLE INFORM-A-GRAM KEY NO. 119

MASTERHEADS

UNIVERSAL FACING AND BORING HEADS

with self-acting slide feeds and automatic end release



For Boring, Turning, Recessing, Undercutting, Underfacing and Taper Cutting

Your highest precision jobs deserve the finest and that is the

WOHLHAUPTER MASTERHEAD

- Automatic Feeds
- Automatic End Release
- 9 Sizes for Work to 36¼"
- 12 Feeds on Larger Models in Increments of 0.0008"

THE FINEST PRECISION UNIVERSAL HEAD BUILT

KARL A. NEISE

Dept. TP-119, 404 4th Ave., New York 16, N.Y.

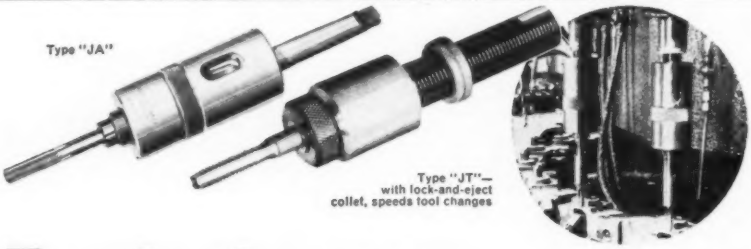
UNIVERSAL FACING AND BORING

WOHLHAUPTER

NEISE MODERNTOOLS

CIRCLE INFORM-A-GRAM KEY NO. 1201

Type "JA"



Type "JT"— with lock-and-eject collet, speeds tool changes

let taps or reamers float free

In reaming or tapping the true solution to the problem of misalignment lies in the use of a "free" floating holder. Unrestricted float is necessary to avoid elliptical holes in reaming and tapered threads in tapping.

Only Scully-Jones floating holders have a double-gear spline drive coupling which provides the required tool movement . . . allows "free" float in all directions. Index errors, machine wear, manufacturing tolerance and heat distortion cannot affect accuracy or finish. "Binding" and "cramping" associated with wobble-type holders are eliminated. So are rejects and tool breakage. There is a size and style for every requirement, including close center work, presetting, quick tool change, horizontal or vertical machining.

Ask your Scully-Jones representative or distributor for Bulletin 8-50. Find him in the yellow pages of your local directory, or call us direct: BIshop 7-5900.

Scully-Jones and Company
1913 South Rockwell Street, Chicago 8, Illinois

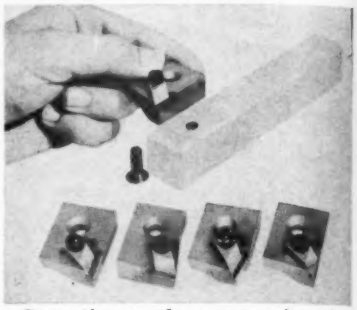
AUTOMATIC RECESSING TOOLS

SCULLY JONES **FLOATING HOLDERS**

CIRCLE INFORM-A-GRAM KEY NO. 1202

Product News

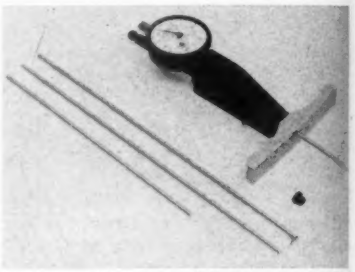
Turning Tool Holder



Save time and money using this disposable toolholder end that attaches to a conventional shank with a single screw. The End-O-Con line of disposable ends is especially designed for cast iron work. Get information from Ends Co., Inc., 515 Luett Ave., Indianapolis, or Circle No. P71.

Simple Groove Location

This double-acting depth gage accurately locates either internal or external grooves. It also measures



tapers with a special taper attachment and by adding a measuring ball it becomes a pin gage. Mueller Gages Co., Div'n of Mueller Laboratory, 1052-1058 N. Allen Ave., Pasadena, Calif., supplies information, or Circle No. P72.

Aluminum Alloy Clamps

New aluminum alloy automatic C-clamps with fast action pushbutton control combine light weight with durability. Sizes available are 2", 3", 4", 6", and 8". Automatic Tool Products Co., 676 Pennsylvania Ave., Elizabeth, N. J., or Circle Inform-A-Gram No. P73.

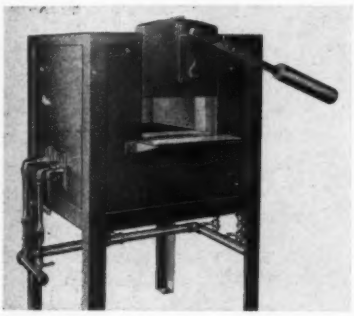
Product News

New Hand Grinder

A new flexible shaft hand grinding tool provides speeds of 500 to 3,500 rpm at the geared end and 3,000 to 15,000 rpm at the direct drive end of the 1/15" hp universal type motor. It features accurate speed control from carbon pile, foot-operated rheostat; has moisture, oil, and grease resistant 36" sheath. For details write The Dumore Co., 1300 17th St., Racine, Wis., or Circle Inform-A-Gram No. P74.

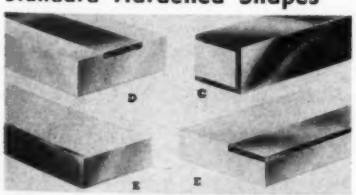
Heat Treating Furnace

This new Model 1218 oven furnace operates in the 2250°F to 2400°F range and uses atmospheric gas burners that permit use for many



applications. Just connect the furnace to available gas supply; no blowers, compressed air, or other power is needed. Charles A. Hones, Inc., 2473 Grand Ave., Baldwin, L. I., N. Y., or Circle Inform-A-Gram No. P75.

Standard Hardened Shapes



More than 12 standard cross-sections in more than 80 sizes of standard hardened shapes are available. They can be used for dies, die sections, flange sections, ways, gibs, and wear plates. Special hardening insures longer, trouble-free life and minimizes downtime. Get Bulletin A from The Ohio Knife Co., Dept. LL-100, Cincinnati 23, Ohio, or Circle Inform-A-Gram No. P76.

30 SECONDS PLEASE!

The WALTER PRECISION ROTARY TABLES are accurate to 30 seconds

With or without Dividing Discs

- HARDENED AND GROUND WORM GEARS BATHED IN OIL FOR LONG LIFE AND ACCURACY
- POSITIVE LOCKING GUARANTEED NOT TO AFFECT THE ACCURATE POSITIONING
- LOW CONSTRUCTION HEIGHT
- 6 Second Reading
- Available in 10", 12½", 15¾", 19¾", 25", 31½".

Write for catalog on Precision Dividing Heads
Karl A, Neise, Dept. TP-119
404 4th Ave., New York 16, N. Y.

PRECISION ROTATION

WALTER

NEISE MODERNTOOLS

CIRCLE INFORM-A-GRAM KEY NO. 1211

Cut MACHINING COSTS 7 WAYS

MAXWELL

UNIVERSAL-POSITIONING

"Throway" Carbide TOOL HOLDER

Also hold square or round tool bits or boring bars with standard clamping cap.

Ask your mill supply house or Maxwell representative

Counterboring

Heavy Turning

Chamfering I. D.

Facing

Chamfering O. D.

1. Adjusts to ANY horizontal position—right, straight, left—in a complete circle. Cuts tool holder inventory!

2. Holds carbide insert to any desired angle or use for facing in either direction—to or from center. The ONLY throwaway carbide tool holder for ANY standard lathe tool post!

3. Precision-ground, positive-rake carbide insert can be indexed FOUR times. Extra savings!

4. Adjustable carbide chipbreaker on cap assembly also can be indexed FOUR times. More economy!

5. Fast, convenient clamping speeds indexing or positioning inserts. Saves time!

6. No need to change tool holder for different work positions. Simply rotate clamping cap and adjust insert. Cuts set-up time!

7. Serrated clamping cap, forged shank and anvil and locking cap screw hold carbide inserts in perfect grip—no lateral movement, no chatter. Cuts scrap loss!

AA-9176

MAXWELL INDUSTRIES, INC.
493 East 5th Avenue • Ashtabula, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 1212

BOREMASTER

For Holes and Cores in One Operation

Bores a 6" hole in 3 1/4" Machine Steel in 6 minutes.
Bores a 5" hole in Boilerplate in 80 seconds.

- Rigid and Heavy-Duty
- Saves Time
- Saves Material (cores intact)
- With or Without Retractable Pilot
- Excellent Chip Load Distribution
- Easy Cutting
- 5 sizes for 1½" to 11¾" dia. work to 8" depth
- Write for the illustrated catalog and learn of the other advantages meaning HIGHER PROFITS FOR YOU

KARL A. NEISE, Dept. TP-119,
404 4th Ave., New York 16, N.Y.

ACCURATE TREPANNING

THE BOREMASTER

NEISE MODERN TOOLS

CIRCLE INFORM-A-GRAM KEY NO. 1221

NOW...index tables

FOR MORE ECONOMICAL PRODUCTION ON THESE NEW

HANNIFIN

"FD" PRESSES

Heavy-duty open-gap production presses with Hannifin hydraulic index tables...

Available in all of these sizes:

2, 3, 4, 5 and 6-ton bench models
6, 8, 10, 12 and 15-ton floor models

WITH THESE FEATURES...	USE THEM FOR...
Dual Safety Hand Lever Controls	Assembly Operations
Dual Electric Push-Button Controls	Riveting—Staking
Adjustable Stroke Control	Forming—Stamping
Reverse on Pressure or Distance	Trimming Die Castings
Full Automatic Cycling	Trimming Plastics
Hannifin High Speed Hydraulic Index Tables	Molding Semi-Conductors
Reciprocating Hydraulic Slide Feeds	Preformed—Compacting

Call in your nearby Hannifin man—he's a trained production analyst—to prove how you can do more at lower cost with Hannifin presses. Or, write for our new Bulletin 132. It tells the whole story.

HANNIFIN COMPANY

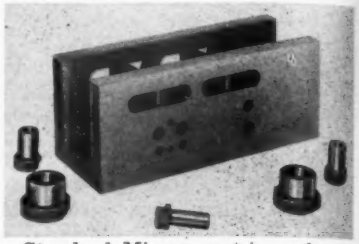
563 South Wolf Road • Des Plaines, Illinois

A DIVISION OF PARKER-HANNIFIN CORPORATION

CIRCLE INFORM-A-GRAM KEY NO. 1222

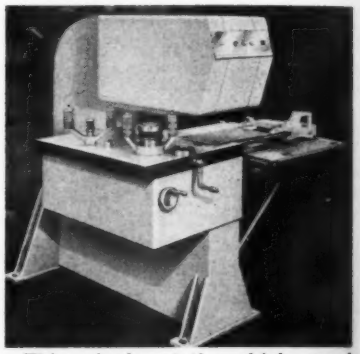
Product News

Jig and Fixture Parts



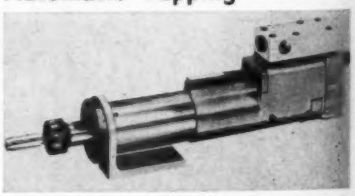
Standard Micron cast-iron shapes for economical building of small jigs and fixtures are now available in 3" to 8" sizes and lengths of 25", which are cut to order. Shapes include U's, T's, hollow squares, rectangles, and flat plates. Write for a bulletin from Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich., or Circle Inform-A-Gram No. P77.

New Fabricator



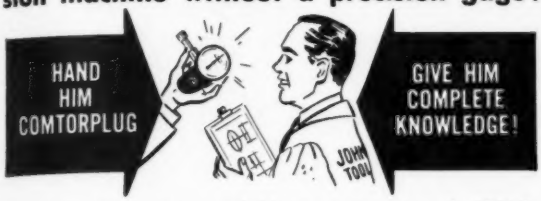
This single-station high-speed punch press has a 30" throat depth capacity and handles a 30" workpiece of any length, utilizing the Strippit multiple-stop gaging system. Information on Super 30 is available from Wales-Strippit, Inc., Akron, N.Y., or Circle No. P78.

Automatic Tapping



Two new Gardner-Denver tappers with controlled pitch lead screw feed produce automatic high-precision tapping without tearing or stripping of threads or tap breakage. Designed for either portable or stationary applications. Tru-Thread tapper Models 93B-OO and 93B-5 cover a range of from #2 to 1" dia hole sizes. Get data from Gardner-Denver Co., Quincy, Ill., or Circle No. P79.

Are you asking him to control a precision machine without a precision gage?



1. exact hole size, readable to a fraction of .0001" (a fixed — not passing — reading).
2. front or back taper, exact amount of.
3. ovality, exact amount of diameter variation.
4. bell mouth or barrel shape.

Self-centering and self-aligning Comtorplug assures precise gaging, easily and simply, independent of operator variations. For holes from ⅛" to 10" diameter.

For holes ⅛" to 10" diameter

COMTORPLUG USERS INCLUDE

Airesearch Mfg. Co.	Fairchild Engine & Airplane Co.	Lycoming-Spencer Div.
Allison Div.	Falk Corp.	McDonnell Aircraft
Buick Motor Div.	Ford Motor Co.	National Lead
Century Electric Co.	General Electric Co.	Northrop Aircraft
Chicago Pneu. Tool	Hamilton Standard Division	Pontiac Motor Div.
Chrysler Corp.	Harris Seybold Co.	Scintilla Magneto
Continental Motors	Homelite Corp.	Steel Products Eng.
Curtiss-Wright	Int. Harvester Co.	Studebaker-Packard
Dana Corporation	Jacobs Mfg.	Sylvania (Atomic Div.)
Detroit Transmission		United Airlines
Douglas Aircraft		Warner Gear Div.

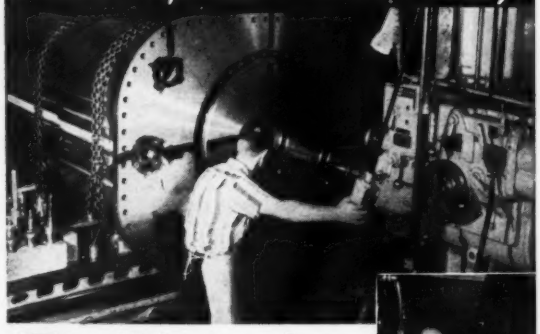
SEND FOR BULLETIN 50 →

COMTOR CO., 82 FARWELL ST., WALTHAM 54, MASS.

COMTORPLUG

CIRCLE INFORM-A-GRAM KEY NO. 1231

Another Tapmatic Success Story!



"We couldn't take a chance on this job!"

"Our problem," reports Herman Barbee, General Foreman, Magna Mill Products, So. Gate, Calif., "was to produce exacting Class 3-B threads in 90 deep blind holes in this 5500 lb. Stainless Steel Weldment.

"The TAPMATIC 800 eliminated the previous time consuming hand tapping operation. Its *floating action* enabled the successful re-entry of the taps following chip removal. Our tap life was increased over 600% and production soared."

TAP WITH TAPMATIC... for consistently perfect threads —maximum tap life—trouble free performance.

TAPMATIC CORPORATION
845 W. 16th Street Costa Mesa, California

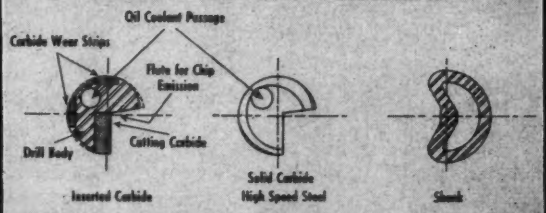
CIRCLE INFORM-A-GRAM KEY NO. 1232

THIS DRILL ELIMINATES SECONDARY OPERATIONS

Just *one* pass with these high-speed steel or carbide-tipped gun drills produces an accurate, truly round, straight hole honed to mirror-bright finish. That's why you can drill small parts of all kinds — *faster, more accurately* and at *lower cost* with HI-STANDARD Gun Drills*.

Production parts that once had to be drilled individually can now be gang-nested and drilled through, producing holes identical in size, location and finish. Drilling of this kind is done on automatic indexing machines, lathes, horizontal and upright drilling machines, and similar equipment. Forced oil feed through the drill clears chips and cools cutting edge for faster drilling. No matter what the size or shape of your workpiece, drilling with HI-STANDARD Gun Drills is an

DRILL TIP AND SHANK CROSS-SECTION



outstanding time-and-money saver. Any material that can be *machined*, can be *gun-drilled*.

Gun drilling is one important way in which forward-thinking manufacturers are increasing production and cutting costs. To find out how your company can do the same, write for your Hi-Standard Engineering File 20 *today!*

*Also called "deep-hole drills"

Pioneers in the Design and Development of Gun Drills for more than 30 Years

THE HIGH STANDARD MANUFACTURING CORP.
HAMDEN • CONNECTICUT

CIRCLE INFORM-A-GRAM KEY NO. 1233

CUMULATIVE EDITORIAL INDEX FOR 1959 ISSUES

TOOLING & PRODUCTION Magazine

SUBJECT INDEX

Air Power
Air cylinders, integral construction, advantages of, Jan. p. 51 (3 pp)
Timing and sequencing of cylinders, June, p. 49 (3 pp)

Assembly
Automatic parts feeding for, March, p. 47 (3 pp)
Brazing, with automatic equipment, Aug., p. 46 (1.33 pp)
Hydraulic press-welding of motor laminates, Oct., p. 68 (2 pp)
Joining missile tube assemblies by brazing, Sept., p. 60 (3 pp)
Stainless steel tanks, of, Oct., p. 49 (2.6 pp)
Welding, to tight specs, Aug., p. 49 (2 pp)

Automation
Assembly and testing, Aug., p. 46 (1.33 pp)
Controls for automated line, June, p. 55 (1 p)
Effective benefits of, Apr. p. 37 (2 pp)
Grinding, of universal crosses, Aug., p. 72 (1.5 pp)
Small lot shop, for, Jan. p. 39 (1½ pp)

Bending
Draw bending missile tubes, Sept., p. 60 (3 pp)
Economical fixtures for, June, p. 47 (2 pp)

Carbide
Bonded to steel by powdered metal, Oct., p. 52 (1 p)
Choosing the lubricant for, June, p. 62 (1 p)
Grinding clinic, electrolytic, July, p. 60 (1.83 pp)
Spindle, construction of, Feb. p. 124 (1.6 pp)
Tool housekeeping, Feb. p. 45 (2.65 pp)
Tools, electrolytic grinding of, Feb. p. 42 (1.39 pp)
Tools, electrolytic grinding of, Feb. p. 43 (1.61 pp)
Tools, evaluation of, Feb. p. 37 (4.5 pp)

Castings
Malleable iron, advantages and design of, Apr., p. 44 (2.51 pp)
Miniature investment, process for, June, p. 66 (1 p)

Clamping
Air, on profiling machine, March, p. 66 (.6 p)
Electrostatic, Apr., p. 40 (.61 p)

Control
Automatic machines, chart for timing and sequencing components of, June, p. 49 (3 pp)
Automatic, for transfer line, June, p. 55 (1 p)
Electronic tracer drive cuts machining time, Feb. p. 51 (2 pp)
Magnetic tape, die sinking costs reduced by, Jan. p. 58 (1 p)
Numerical, in industry, July, p. 9 (1.5 pp)
Tape, automatic welding by, Jan. p. 54 (1 p)
Tape, for small lot shop automation, Jan. p. 39 (1½ pp)
Tape, with tool changing, March, p. 50 (1 p)

Cost Cutting
Drilling operations combined for, Apr., p. 49 (1.91 pp)
Effective automation for, Apr., p. 37 (2 pp)
Steel rule dies, for, March, p. 65 (1.4 pp)
Tool grinding, electrolytic vs conventional, by, Feb. p. 42 (1.39 pp)
Welded pole pieces redesigned for, June, p. 59 (2 pp)

Cutting Tools
Carbide, choice of lubricant for, June, p. 62 (1 p)

Cylinders
Air, integral construction, advantages of Jan. p. 51 (3 pp)
Timing and sequencing of, graphic design method for, June, p. 49 (3 pp)

Diamonds
X-ray orientation of, Apr., p. 56 (2 pp)

Dies
Color coding, for safety, Oct., p. 58 (2 pp)
Mechanized unloading of, Feb. p. 49 (2 pp)
Plastic, for drawing, Oct., p. 64 (1 p)
Progressive, "built backwards," Oct., p. 43 (3.3 pp)
"Shimmy," for shell trimming, June, p. 45 (2 pp)
Steel rule, building of, March, p. 65 (1.4 pp)

Drilling
Ganged drill presses cut costs, Apr., p. 49 (1.91 pp)
Gun, of plastics, Sept., p. 66 (2.49 pp)
Gun, requirements for general purpose, July, p. 54 (2.75 pp)
New production techniques, Feb. p. 55 (4 pp)

Economics, Industrial
Cost of a man-hour, Sept., p. 51 (2.5 pp)
Depreciation an element in investment decisions, Feb. p. 11 (2.5 pp)
Equipment leasing, Sept., p. 51 (1.6 pp)
Foreign competition, Aug., p. 33 (1 p)
Foreign competition and American ingenuity, Oct., p. 26 (1.8 pp)
Foreign trade, effect of European Common Market on, June, p. 21 (.85 pp)
Inflation, competition, and depreciation, Aug., p. 7 (1.16 pp)
Machine replacement form, Sept., p. 78 (.7 p)
Modernization and expansion, Sept., p. 49 (2.4 pp)
Nomographs for determining lot size, Sept., p. 53 (3 pp)
Obsolescence factors, Sept., p. 47 (2 pp)
Tax saving techniques, Sept., p. 44 (2.85 pp)
Value analysis, Sept., p. 39 (1.7 pp)

Fixturing
Aluminum tooling plate, with, June, p. 58 (1 p)
Ceramic for high temp tooling, June, p. 43 (2 pp)
Economical, for bending, June, p. 47 (2 pp)
Low cost for power saws, Apr., p. 41 (2.66 pp)
Vacuum, for thin castings, Apr., p. 47 (1 p)

Forming
Cold, of ID's, Oct., p. 63 (1 p)
Explosive, status of, May, p. 67 (.86 pp)
Hot, of steel plate, Aug., p. 54 (3 pp)
PH steels, modifications for, Oct., p. 72 (2 pp)

Furnaces
Heat treating, guide to manufacturers of, June, p. 52 (2.8 pp)
Vacuum arc melting, for tool steels, June, p. 40 (.66 pp)
Heat treating, trends in design of, March, p. 53 (4 pp)

Gages
Accuracy and control of, for current needs, Apr., p. 6 (1.5 pp)
Effect of new international inch on, June, p. 39 (1 p)
Systematic control of, Jan. p. 41 (4 pp)

Gears
Optical inspection system for, Jan. p. 60 (1 p)

Grinding and Finishing
Automatic, of universal crosses, Aug., p. 72 (1.5 pp)
Centerless, Norton's new machine, Aug., p. 66 (.66 p)
Electrolytic, interchangeable units for, Sept., p. 72 (.81 p)
Electrolytic of carbide tools at Thompson Ramo Wooldridge, Feb. p. 42 (1.39 pp)
Electrolytic, of carbide tools, at Timken Roller Bearing, Feb. p. 43 (1.61 pp)
Stainless steel tanks, of, Oct., p. 49 (2.6 pp)
Tools, clinic for, July, p. 60 (1.83 pp)
Wheels, tests for hardness of, March, p. 63 (1.94 pp)
X-ray orientation of diamond truing tools for, Apr., p. 56 (2 pp)

Heat Treating
Controlled atmospheres, types and uses of, May, p. 40 (4 pp)
Equipment, guide to manufacturers of, June, p. 52 (2.8 pp)
Flame hardening, of dies, and fixtures for, Oct., p. 53 (3 pp)
Furnaces and equipment, trends in design of, March, p. 53 (4 pp)
Metallurgy of, July, p. 48 (2.75 pp)
Steel plate, with hot forming, Aug., p. 54 (3 pp)
Surface treatments, Sept., p. 56 (3 pp)

Honeycomb
Alply Sandwich, Anybody? Feb. p. 35 (1 pp)

Hydraulics
Bubbles in lines, answer to, July, p. 65 (1 p)

Inspection
Cams, semi-automatic setup for, Apr., p. 46 (.49 p)
Gears, optical system for, Jan. p. 60 (1 p)

Lubricants
Choice of, for carbides, June, p. 62 (1 p)

Machine Tools
European production of, Jan. p. 7 (1¾ pp)
Grinder, non-vibrating foundation for, Jan. p. 45 (2½ pp)
Historical, Aug., p. 64 (1.5 pp)
Standards, building blocks, industry agrees on, July, p. 35 (13 pp)
Transfer-type, for unusual part, Oct., p. 46 (1.1 pp)

Machining
Double-end, retooling speeds, Aug., p. 41 (2 pp)
Drilling, new production techniques, Feb. p. 55 (4 pp)
Electronic tracer drive, for, Feb. p. 51 (2 pp)
Finish milling, causes of hard spots in, March, p. 57 (3 pp)
Tape-controlled, with automatic tool changer, March, p. 50 (1 p)
Throw-away tools, with, Aug., p. 60 (2 pp)

Management
Depreciation, an element in investment decision, Feb. p. 11 (2.5 pp)
Executive development prerequisites, March, p. 6 (1.25 pp)
Labor, productivity, and competition, May, p. 20 (2 pp)

Materials
Alply Sandwich, Anybody? Feb. p. 35 (1 p)
Die steel, vacuum degassed, Oct., p. 48 (1 p)
Malleable iron, advantages of, for castings, Apr., p. 44 (2.51 pp)

Milling
Climb vs conventional, Apr., p. 39 (1.39 pp)
Finish, hard spots, causes of, March, p. 57 (3 pp)

Parts Feeding
Automatic, for switch assembly, March, p. 47 (3 pp)

Patents
Determination of "inventorship," June, p. 57 (1 p)
Engineers and patent suits, Sept., p. 76 (1.3 pp)
Importance of keeping records of inventions, Apr. p. 51 (1.66 pp)
Inventions, problems in exploiting, Aug., p. 47 (1.66 pp)
Patent talk vs English language, March, p. 51 (1.4 pp)

Personnel
No more goldbrickers, Jan. p. 37 (1 p)

Plants
Allen Mfg. Co., tour of, Feb. p. 122 (1 pp)
Gisholt Machine Co., Plastics Dept., tour of, June, p. 56 (1 p)

Plastics
Fiberglass reinforced, production of, June, p. 56 (1 p)
Gun drilling of, Sept., p. 66 (2.49 pp)
Tooling, report on current uses, Jan p. 48 (2 pp)

Pressworking
Blanking presses, high-speed, March, p. 52 (.6 p)
Hydraulic, with welding, Oct., p. 68 (2 pp)
Laminations for pole pieces, of, June, p. 59 (2 pp)
Mechanized, of stainless steel trim, Feb. p. 49 (2 pp)
"Shimmy" dies for trimming, case history, June, p. 45 (2 pp)
Stainless steel tanks formed, assembled, polished, Oct., p. 49 (2.6 pp)

Quality Control
Aircraft production techniques for, May, p. 37 (2.65 pp)
Dimensional, gaging and measuring for, Apr., p. 6 (1.5 pp)
Parts qualification programs, Sept., p. 8 (.9 p)
Program for, at Cleveland Graphite Bronze, May, p. 44 (5 pp)
Quality Pre-Control and projectors, Aug., p. 62 (2 pp)
Small lot production, program for, May, p. 49 (1.5 pp)
Statistical basis of attribute sampling, May, p. 56 (3 pp)
Systematic gage control for, Jan. p. 41 (4 pp)
Teamwork needed for, May, p. 35 (2 pp)

Reliability
Engineering, today and tomorrow, Aug., p. 37 (4 pp)
Parts qualification programs, Sept., p. 8 (.9 p)
Vacuum valve offers, Aug., p. 51 (2 pp)

Sawing
Power, simple fixturing for, Apr. p. 41 (2.66 pp)

Spindles
Carbide, construction of, Feb. p. 124 (1.6 pp)

Standards
Building Block, industry agrees on, July, p. 35 (13 pp)

Surfaces
Machined, hard spots in, causes of, March, p. 57 (3 pp)

Swaging
Rotary, what it is and does, Oct., p. 56 (2 pp)
Valve housing tubing, application of, Jan. p. 50 (1 p)

Systems
Gage control for quality control, Jan., p. 41 (4 pp)
Tool traffic, better communication speed, Aug., p. 43 (3 pp)

Tape Control
Automatic welding by, Jan. p. 54 (1 p)
Machine tool, computer-less equipment for, Apr., p. 48 (1 p)
Small lot shop automation, for, Jan., p. 39 (1½ pp)

Tapping
Trouble shooter's guide for, March, p. 61 (1.7 pp)

Testing
Grinding wheel hardness, for, March, p. 63 (1.94 pp)

Tooling
Aluminum, its place in industry, June, p. 58 (1 p)
Make or buy, Oct., p. 74 (1.84 pp)
Plastic, report on current uses for, Jan. p. 48 (2 pp)

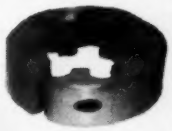
Turning
Gage for lathe work, May, p. 50 (.5 pp)
Micrometer controlled lathe center, Apr., p. 60 (1.54 pp)

Welding
Automatic, by tape control, Jan. p. 54 (1 p)
Automatic, fixturing for, March, p. 60 (.8 pp)
Semi-automatic, pole pieces redesigned for, June, p. 59 (2 pp)

SAVE THIS AD FOR FUTURE REQUIREMENTS—DEALER INQUIRIES INVITED

NEW SIZES ADDED DAILY . . . IF NOT LISTED HEREIN—INQUIRE

WHY WAIT



DELIVERY FROM STOCK

SPECIAL Right & Left Hand High Speed Taps - Dies & Thread Plug Gages

SIZE	THREADS PER INCH
0000	160
000	120
00	90-96-112
0	56-64-72-76-80-90
1	48-56-60-64-80-90
2	48-52-54-56-60-72-80
3	36-40-60-64-72-80
4	30-32-38-42-44-56-60-64-72-80-90
5	22-27-30-32-36-38-42-48-50-56-60-64-72-80
6	24-28-30-36-38-42-44-48-56-60-64-72-80
7	28-30-32-34-36-38-40-48-64
8	24-26-28-30-38-40-44-48-56-60-64-72-80
9	24-28-30-32-36-40
10	18-20-22-26-28-30-36-40-48-56-60-64-72-80
11	20-22-24-28-30-32-36
12	20-22-26-27-30-32-36-38-40-48-56-60-64-72-80
13	20-22-24-28-32
14	14-16-18-26-28-30-32-36-40
15	18-20-24-28-32
16	16-18-20-22-24-28-32-36
17	16-20
18	16-18-20-24-32-40
19	18-20
20	14-16-18-20-24-32
22	16-18-20-24
24	14-16-18-22-24
26	14-16-20-24
28	14-16-20
30	14-16-20
1/16	56-60-64-72
5/64	56-60-64-72
3/32	32-36-38-48-50-56-60-64
.107	52
7/64	36-40-42-44-48-50-56
1/8	30-32-36-38-40-48-56-60-80
.132	50
9/64	30-32-38-40
.148	38
5/32	24-26-28-30-32-36-38-40-50
11/64	24-26-30-32-36-38-40
3/16	12-18-20-22-24-26-27-28-30-32-36-40-48-56-64-72
.198	24

SIZE	THREADS PER INCH
13/64	24-28-30-32-36-40
7/32	20-22-24-26-27-28-30-32-36-38-40
.227	24
15/64	20-22-24-28-36-40
1/4	10-12-14-16-18-22-23-24-25-26-27-30-32-36-38-40-48-50-56-60-64-72-80
17/64	12-18-20-24-27-28-32
.277	40
9/32	16-18-20-24-26-27-28-32-36-40-46
19/64	18-24
.300	28
5/16	12-14-16-20-22-26-27-28-30-32-36-40-48-50-56-64
21/64	16-18-20-24-36
11/32	16-18-20-22-24-26-27-28-32-36-40
23/64	16-24
.365	28
3/8	12-14-18-20-22-26-27-28-30-32-36-40-44-48-56-64
25/64	14-16-18-20-24-27
.402	24
13/32	12-14-16-18-20-24-27-32-40
27/64	14-20-24-28-32-36
7/16	10-12-16-18-22-24-26-27-28-30-32-36-40-48-56
29/64	12-14-16-20
15/32	12-14-20-24-27-28-32-36-40
1/2	10-11-12-14-16-18-22-24-26-27-28-30-32-36-40-44-48-56
33/64	12-13-20-24
17/32	10-12-13-14-16-18-20-24-27-28-32-40
.550	24
9/16	10-13-14-16-20-24-26-27-28-30-32-36-40-48
37/64	10-12-18-20-27
19/32	12-18-20-24-28-32-36-40
5/8	9-10-12-13-14-16-20-24-26-27-28-30-32-36-40-56

SIZE	THREADS PER INCH
41/64	11-18-24
21/32	10-11-18-20-24-27-32-40
11/16	10-11-12-14-16-18-20-22-24-27-28-30-32-36-40
23/32	11-12-16-18-20-27-32-36-40
47/64	10-12-16-18-20
3/4	8-9-11-12-14-15-18-20-22-24-26-27-28-32-36-40
49/64	10-16-18-20
25/32	10-12-16-18-20-24-27-32-40
.800	16
13/16	8-10-12-14-16-18-20-24-27-28-32-40
.835	16
55/64	6-12
27/32	9-10-18-20-24-27-32-40-48
.850	14
7/8	8-10-11-12-13-16-18-20-24-26-27-28-32-36-40
29/32	9-12-14-20-24-27-28-32
15/16	8-9-10-12-14-16-18-20-24-27-28-32-40
31/32	9-12-16-18-20-24-28-32
1	5-9-10-11-12-16-18-20-24-26-27-28-30-32-36-40-48
1-1/32	8-12-14-16-18-20
1-3/64	12-14-16-18-20
1-1/16	8-10-12-14-16-17-18-20-24-27-28-32-40
1-3/32	7-8-9-12-14-16-18-20-32
1-1/8	8-10-14-16-18-20-24-27-28-32-40
1-5/32	7-8-9-12-14-16-18-20-24-32
1-11/64	18
1-3/16	7-8-10-12-14-16-18-20-24-32-40
1-1/4	8-10-14-16-18-20-24-27-28-32-40
1-5/16	6-7-8-10-12-14-16-18-20-24-27-28-32-40-48
1-3/8	5-8-10-14-16-18-20-24-32-40
1-13/32	12-16-18-20
1-7/16	6-8-10-12-14-16-18-20-24-27-28-32-40

SIZE	THREADS PER INCH
1-1/2	7-8-9-10-13-14-16-18-20-24-27-28-32-40
1-17/32	7-12-18-20
1-9/16	6-8-10-12-14-16-18-20-24-32-40
1-5/8	5-5½-6-8-10-11½-12-13-14-16-18-20-24-28-32-40
1-11/16	8-10-12-14-16-18-20-24-32
1-23/32	5-8-12-16-18-20
1-3/4	5-6-8-10-12-13-14-16-18-20-24-28-32-40
1.767	18
1.7715	12
1-13/16	8-10-12-14-16-18-20-24-32
1-7/8	5-8-10-12-14-16-18-20-24-32
1-29/32	12-16-18-20-32
1-15/16	8-10-12-14-16-18-20-24-32
2	4½-6-8-10-12-14-16-18-20-24-28-32
2-1/16	8-10-12-14-16-18-20-24-32
2-1/8	4½-8-10-12-14-16-18-20
2-3/16	8-10-12-14-16-18-20-24
2-1/4	4½-8-10-12-14-16-18-20-24
2-5/16	8-10-12-14-16-18-20-24
2-3/8	4-8-10-12-14-16-18-20-32
2-7/16	8-10-12-14-16-18-20
2-1/2	4-6-8-10-12-14-16-18-20
2-9/16	8-10-12-14-16-18-20
2-5/8	4-8-10-12-14-16-20
2-11/16	8-10-12-14-16-18-20
2-3/4	4-8-10-12-14-16-18-20-32
2-7/8	4-8-10-12-14-16-18-20-24-32
2-15/16	8-10-12-14-16-18-20-32
3	3½-4-8-10-12-14-16-18-20
3-1/8	4-8-10-12-14-16-20
3-3/16	4-8-10-12-14-16-20
3-1/4	4-8-10-11-12-14-16-18-20
3-3/8	4-8-10-12-16
3-1/2	4-8-10-12-16
3-3/4	4-8-10-12-16
4	4-8-10-12-16
4-1/8	4-8-10-12-16
4-1/4	4-8-10-12-16

Many more sizes in stock up to 6" dia.

LEFT HAND N.C. (USS)—N.F. (SAE) SIZES

SEE ABOVE SECTION FOR MORE SIZES

SIZE	THREADS	SIZE	THREADS	SIZE	THREADS	SIZE	THREADS
0	80	8	32-36	7/16	14-20	1"	8-12-14
1	64-72	10	24-32	1/2	13-20	1-1/8	7-12
2	56-64	12	24-28	9/16	12-18	1-1/4	7-12
3	48-56	14	20-24	5/8	11-18	1-5/16	6-12
4	36-40-48	1/4	20-28	11/16	11-16	1-3/8	6-12
5	40-44	5/16	18-24	3/4	10-16	1-7/16	6-12
6	32-40	3/8	16-24	7/8	9-14	1-1/2	6-12

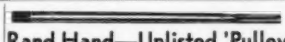
'OVERSIZE' and 'UNDERSIZE' TAPS

RIGHT AND LEFT HAND N.C. AND N.F. SIZES

MACHINE SCREW	#2 to #5	Plus or Minus	.003, .005, .010
MACHINE SCREW	#6 to #14	Plus or Minus	.002, .003, .005
FRACTIONAL	1/4" to 1-1/2"	Plus or Minus	.003, .005, .010, .015, 1/64, 1/32

Right & Left Hand—Unlisted 'Gun' or Spiral Pointed Taps

Size	Threads	Size	Threads
0	80 NF		
1	56 NS	7/8	9 NC, 14 NF
2	56 NC, 64 NF	1	8 NC, 12-14 NF
9/16	12 NC, 18 NF	1-1/8	7 NC, 12 NF
5/8	11 NC, 18 NF	1-1/4	7 NC, 12 NF
11/16	11 NS, 16 NS	1-3/8	6 NC, 12 NF
3/4	10 NC, 16 NF	1-1/2	6 NC, 12 NF



Rand Hand—Unlisted 'Pulley' And Extra Length Taps

Size	Threads	Size	Threads
4	36-40 NC, 48 NF	3/8	24-NF
5	40 NC, 44 NF	7/16	20 NF
6	32 NC, 40 NF	1/2	20 NF
8	32 NC, 36 NF	9/16	12 NC
10	24 NC, 32 NF	9/16	18 NF
12	24 NC, 28 NF	5/8	18 NF
1/4	28 NF	3/4	16 NF
5/16	24-NF	Also Larger Sizes	NC & NF

UNLISTED Right Hand "Pipe" Taps

"NPT" Taper "NPT" Size	Thread	"NPS" Size	Thread	EX. LENGTHS "NPT" & "NPS" Size	Thread
1/16	27	1/16	27	1/16	27
1/4	27	1	8	1/8	27
2-1/2	8	1-1/4	11½	1/4	18
3	8	1-1/2	11½	3/8	18
3-1/2	8	2	11½	1/2	14
4	8	2-1/2	8	3/4	14
Also British		3	8	1	11½
		3-1/2	8		
		4	8		
		Also British		Also British	

Lefthand 'Pipe Taps' Taper and Straight

Size	Thread	Size	Thread
1/16	27	1	11½
1/8	27	1-1/4	11½
1/4	18	1-1/2	11½
3/8	18	2	11½
1/2	14	2-1/2	8
3/4	14	3	8
Also British		Also British	

The Largest Stock of

Special and Standard Taps, Dies, Plug Gages

SPECIAL RING GAGES

IF NOT IN STOCK

2 WEEKS DELIVERY

ACME TAPS IN STOCK

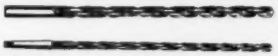
IF NOT IN STOCK—7 to 10 DAYS DELIVERY—When ordering or requesting quotations, kindly furnish following information:

(a) Kind of material being machined.
(b) Depth of hole, through or bottom.
(c) Tap to be used horizontally or vertically.
(d) Will tap turn, or is piece expected to be turned.
(e) Is tapping job expected to be done in one pass.
(f) Would tap be backed out of hole, or machined stopped for release of tap.
(g) If possible, submit thread length, and overall length of tap desired with blue print.

SPECIAL REAMERS

Immediate Delivery

H.S.S.S. Machine Reamers Decimal, Fractional, Letter, and Wire Gauge Sizes Prices On Application



SPECIAL—Right Hand High Speed "EXTRA LENGTH DRILLS" In Stock for Immediate Delivery

DELIVERY! QUALITY! PRICE!

You always get more for your money at . . .

CIRCLE INFORM-A-GRAM KEY NO. 125

FIELD TOOL SUPPLY CO.

Industrial Cutting Tools

31 S. DES PLAINES ST., CHICAGO 6, ILL.

All Phones: Financial 6-1195

THE QUALITY EXTRA...

in S&E Tungsten Carbide Tools

—IS FREE

Tool performance that increases your production and profits—yet costs you less money . . . it's what you want and what you get —when you use S&E TOOLS

That extra quality is no accident. It is the product of more than 20 years experience in the design and manufacture of Tungsten Carbide Tools.

Prove to your own satisfaction that the performance and stamina you need in tooling today—you get in S&E. A fully illustrated catalog of standard and special tools is available upon request.

WRITE:

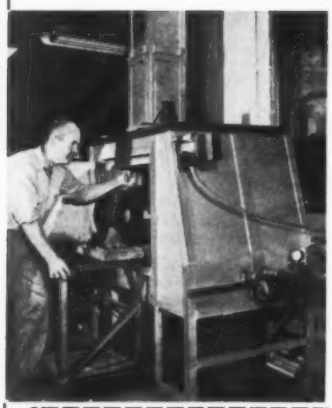
S&E MACHINE PRODUCTS INC.

Bridgeport, Michigan

Representatives in all principal cities.

CIRCLE INFORM-A-GRAM KEY NO. 1261

A Smog Free *multi-purpose* Oven



A combination insulation burn-off, bake and curing oven, approved by the Los Angeles County Air Pollution Control District. Presently used by electric motor and auto parts rebuilders. Standard units available. Mail coupon for further information.

CUSTOM BUILT

to your specification

or standard models available

A. D. Alpine Inc.
11837 Teale St., Dept. Z
Culver City, Calif.

Name_____

Address_____

CIRCLE INFORM-A-GRAM KEY NO. 1262

ADVERTISER'S INDEX

Ace Drill Bushing Company 79
Ace Drill Corporation 102
Acme Tool Corporation 105
Acro Metal Stamping Co. 98
Aget Manufacturing Co. 109
Alina Corporation 130
Allegheny Ludlum Steel Corp. 115
A. D. Alpine, Inc. 126
American Drill Bushing Co. 3
Ampco Metal, Inc. 80
Armstrong Brothers Tool Co. 106
Atlas Press Company, Clausing Division 114

Bald Eagle Corporation 90
Barber-Colman Company 20
Bausch & Lomb Optical Co. 18
Bellows Company 73
Benco Collet Mfg. Co. 132
E. W. Bliss Company 99, 116
Boice-Crane Co. 105
Buck Tool Company 117
H. L. Bushman Co., Inc. 95

Capewell Mfg. Co. 78
Cardinal Machine Co. 94
Central Safety Equipment Co. 118
Challenge Machinery Co. 119
Cincinnati Milling Machine Co. . . . 53
Clausing Division, Atlas Press Company 114
Clearing Machine Corporation Div. of U. S. Industries, Inc. . . . 131
Cleveland Grinding Machine Co. . . . 101
Cleveland Tool & Die Co. 84
Cogsdill Tool Products, Inc. 72
Comet Tool Company 106
Commander Manufacturing Co. . . . 116
Comtor Company 123
Conical Tool Co. 128
Cook's Lead Hammer Service 116
Cosa Corporation 96
Covel Manufacturing Co. 56

Dayton Rogers Mfg. Co. 118
Delta Power Tool Div., Rockwell Mfg. Co. 31
Detroit Power Screwdriver Co. 17
Detroit Reamer & Tool Co. 29
Detroit Stamping Company 22
Detroit Testing Machine Co. 93
Dexco Corp., Raymac Div. 118
J. W. Dice Company 91
Dickerman Mfg. Co. 103
Dremel Mfg. Co. 128
Dumore Company 81
Durable Punch & Die Co. 62
Durant Tool Supply Co. 94
Dykem Company 91

Eastman Kodak Company 61
Economy Engineering Co. 129
Edlund Machinery Corp. 69
Eisler Engineering Co. 95
Enco Manufacturing Co. 90
Erickson Tool Company 32
Ettco Tool & Machine Co. 129

Federal Press Co. 63
Federal Products Corp. 57
Federal Tool Corp. 100
Fenn Manufacturing Co. 11
Field Tool Supply Co. 125
Futurmill, Inc. 71

Gaertner Scientific Corp. 93
Gage Company 118
Gardner-Denver Company 67
Genesee Manufacturing Co. 113
George Gorton Machine Co. 6
Graphic Systems 91
Greenlee Bros. & Co. 13

BURR-BIT CUTS TAPPING COST WAY DOWN!

Just lock Burr-Bit on any make tap and holes are deburred automatically, leaving a smooth clean chamfer. ONE operation, ONE setup, ONE handling.

NEW ADDITION
Now Burr-Bit fits 3 fluted taps from #6 to ½". Also available to fit any tap 2 or 4 fluted from #2 to ¾", as well as heli-coil.

A quality product made of the finest high speed tool steel for use on almost every material. WRITE now for complete data and reports from engineers who have adapted Burr-Bit and saved on *their* tapping operations.

INVESTIGATE Burr-Bit today.

VERNON DEVICES, Inc.
481 E. 3rd Street Mt. Vernon, N.Y. MOunt Vernon 4-1686

CIRCLE INFORM-A-GRAM KEY NO. 1271

Mahr 50 Millionths Reading Mahr
SELF-CENTERING
BORE GAGES

Check bores for size, out-of-round and taper in any spot and to any depth within range of instrument to an absolutely reliable accuracy of

50 MILLIONTHS of an inch

THIS HIGH PRECISION INSTRUMENT IS AN INEXPENSIVE, ACCURATE AND DEPENDABLE **INTERNAL COMPARATOR**

FINE ADJUSTMENT
ADJUSTABLE LIMIT HANDS

Small Bore Gages

RANGE .060" TO .160"
PRICE $126.00
Complete in Hardwood Case

RANGE .160" TO .280"
PRICE $110.00
Complete in Hardwood Case

OTHER SIZES UP TO 10"

GUARANTEED Mahr QUALITY

MEASURING HEADS ARE HARDCHROME PLATED FOR MAXIMUM WEAR

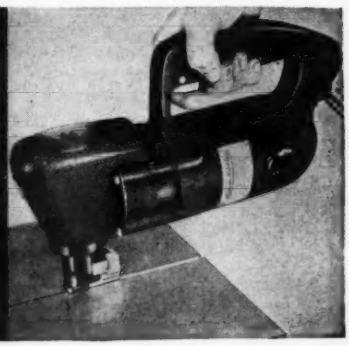
IF NOT AVAILABLE AT YOUR FAVORITE SUPPLY HOUSE — WRITE TO US FOR ILLUSTRATED FOLDER.

HEADQUARTERS FOR PRECISION MEASURING INSTRUMENTS AND FINE TOOLS

MAHR GAGE CO., INC.
274-TO Lafayette St. • New York 12, N.Y.

CIRCLE INFORM-A-GRAM KEY NO. 1273

CUT METAL *FAST,* WITHOUT DISTORTION USE
MODERN NIBBLERS



They cut 10 gage stainless, 8 gage mild steel, 7 gage aluminum and brass without bending or curling the metal.

They cut 6" (and smaller) radius.

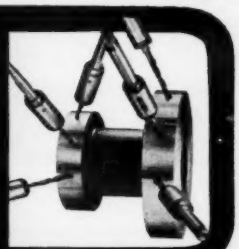
Models are available for cutting corrugated metal, fibre glass and plastic without cracking or chipping. Other models for cutting wire netting, irregular rods, gaskets, etc.

A MODEL FOR CUTTING ¼" COLD ROLLED STEEL AVAILABLE SOON!

Write, wire or call
MODERN MFG. CO., INC.
680 Davisville Road, Willow Grove, Pa.
'Phone: Willow Grove 4820

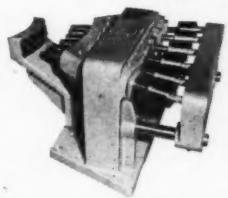
CIRCLE INFORM-A-GRAM KEY NO. 1272

Can you drill this
PERIPHERAL HOLE PATTERN
at a profit?



U.S. Drill Head engineers can show you the cost-reducing way to do these tough jobs—just as they did for a missile manufacturer, producers of automotive parts, diesel engines, and in many other industries.

New products of the space age continually bring new manufacturing problems. Take advantage of U.S. Drill Head Co.'s leadership in applying multiple drilling and tapping heads to your drilling operations.



U.S. Fan-Shaped Heads for peripheral drilling—full ball bearing shaft mounting, shaved gears, super-finish spindles, full torque, maintained precision.

US DRILL HEAD
Adjustable and Fixed Center Multiple Drilling Heads. Individual Lead Screw Multiple Tapping Heads.
UNITED STATES DRILL HEAD CO.
BURNS STREET • CINCINNATI 4, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1274

Attach this page to your letterhead
and forward for our new 16-page catalog.

CONICAL TOOL CO. 3890 Buchanan S.W.
Grand Rapids 8, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 1281

GRIND-DEBURR-POLISH

Faster and Easier with a

DREMEL MOTO-TOOL

No other grinder, regardless of size, power, or price can take the place of the Dremel Moto-Tool. It's lightweight (16 ounces) and handles like a pencil. Gives the operator extreme accuracy for close-tolerance work—and easy operation in tight places impossible to reach with large grinders. The Moto-Tool's high speed (27000 RPM) makes it ideal for use with small mounted wheel points. It's also handy for production deburring, and a perfect size and weight for women operators.

The Dremel Moto-Tool is an indispensable, all-purpose grinder for the tool room—a time-saver for the production line—an industrial favorite since 1936.

Model No. 2 Moto-Tool only .. $19.95
Model No. 2 Moto-Tool Kit with 23 accessories and storage case .. $27.50

Order from Your Supplier or Write for Tool Catalog

DREMEL MFG. CO., Dept. 529-L, Racine, Wisconsin

CIRCLE INFORM-A-GRAM KEY NO. 1282

ADVERTISER'S INDEX

Hamilton Tool Company 107
Hannifin Company
Div., Parker-Hannifin Corp. 122
Hardinge Brothers, Inc. 10, 89
Heimann Mfg. Co. 116
Heinrich Tools, Inc. 110
Heuser Mfg. Co. 129
High Standard Mfg. Co. 123
Charles A. Hones, Inc. 78
Horspool & Romine Mfg. Co. 97
Hovis Screwlock Co. 104
Huebner Publications, Inc. .. 58, 86, 129
Wm. T. Hutchinson Co. 8
Hydraulic Press Mfg. Co. 23

Ideal Industries, Inc. 105
Industrial Tectonics, Inc. 98
Ingersoll Milling Machine Co. 85

Jergens Tool Specialty Co. 101
S. C. Johnson & Son, Inc. 75

Kearney & Trecker Corp. 55
Kidde Precision Tool Corp. 95, 102

Lempco Industrial, Inc. 110
Lennox Tool & Machine Builders ... 58
Lepel High Frequency Labs. 113
F. J. Littell Machine Co. 116
Logan Engineering Co. 70

Magna Driver Corp. 98
Mahr Gage Company 127
Marshall Steel Company 101
Maxwell Industries, Inc. 121
Mead Specialties Company 19
Meier Brass & Aluminum Co. 64
W. F. Meyers Co., Inc. 113
Micrometrical Mfg. Co. 83
Modern Manufacturing Co. 127
Moore Special Tool Co. 76, 94

Karl A. Neise 120, 121, 122
Niagara Machine & Tool Works ... 9
Northwestern Tools, Inc. 98

Ohio Knife Co. 27
O'Neil-Irwin Mfg. Co. 12
Opto-Metric Tools, Inc. 101

Penn Engrg. & Mfg. Corp. 14
Perkins Machine Co. 108
Pipe Machinery Co. 24
Porter Precision Products 68
Prebco Bushing Co. 102
Procunier Safety Chuck Co. 129
Producto Machine Co. 66

Raymond Manufacturing Division,
Associated Spring Corp. 106
Reid Tool Supply Co. 93
J. A. Richards Co. 109
Ring Punch & Die Div.,
Producto Machine Co. 110
Rockwell Mfg. Co.,
Delta Power Tool Div. 31
Rodgers Hydraulic, Inc. 82
Rotor Tool Company 59

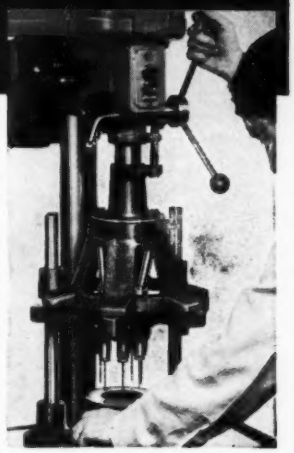
S & E Machine Products, Inc. 126
S-P Manufacturing Corp. 54
George Scherr Company 110
Geo. T. Schmidt, Inc. 36
Scully-Jones & Company 120
Service Machine Co. 102
Sheldon Machine Co. 111
Sheridan Products Co. 93
Shore Instrument & Mfg. Co. 95
R. L. Spellman Co. 116
Star Stainless Screw Co. 91
Superior Steel Products Corp. 15
Sutton Tool Company 2

ETTCO-EMRICK

Knuckle-heads

fully adjustable for dependable multi-hole drilling and tapping

5 models to choose from — circle or straight line types



- Chrome nickel universal ball joint type spindles.
- Adapt to any drill press or drilling or tapping unit or machine — Operate in any position.
- Quickly convertible for either drilling or tapping on any drill press.
- Lubricated ball joints with neoprene covers — an Ettco exclusive.
- Tap or drill capacities up to ⅝" in steel.
- Precision built, lightweight and compact.
- Unconditionally guaranteed for workmanship, material and performance.

Write for complete details today . *Buy them from your Ettco Distributor*

Ettco-Emrick

ETTCO TOOL & MACHINE CO., INC.

584 JOHNSON AVENUE, BROOKLYN 37, NEW YORK

CIRCLE INFORM-A-GRAM KEY NO. 1291

STOP SPIRALING TAPPING COSTS

If you're throwing profits in the scrap barrel in the form of broken taps, spoiled parts, inaccurate threads—now is the time to check your equipment. High speed Procunier Tappers will enable you to get *full production* out of every operator, *better production* out of every machine—without sacrificing quality or increasing production schedules. In shop after shop they have demonstrated their superior performance by providing more parts per hour, greater flexibility and speed, longer life and reducing down time drastically. They combine profit making, cost cutting advantages. They boast a scientifically engineered combination of compactness, light weight, high efficiency, durability and inexpensive maintenance. If you want to keep costs down and profits up—investigate Procunier—it will pay you to do so.

SEND FOR FREE BROCHURE

giving the full story on the entire Procunier line of cost cutting tapping equipment. Write today.

PROCUNIER Safety Chuck Co.

12-14 S. Clinton St. Dept. 11, Chicago 6, Ill.

CIRCLE INFORM-A-GRAM KEY NO. 1292

ALL NEW

MARK II Shoplifter

New Low Price $195.00 *

New Capacity Full 750 lbs.

All lifters at this price *are not* the same. Compare and note the quality of the new Mark II, which now replaces the Type D Shoplifter. Full 750 lb. capacity can be handled safely anywhere on the platform.

No-drift, full control hoist unit. Raise or lower the load to fractional positioning. Built for years of continuous service with minimum maintenance. *Compiete* safety features included at no extra cost.

Applicable in small plants for "too heavy to lift loads" and in large plants to supplement powered equipment. The economical way to transfer molds and dies, unload trucks, stack in narrow aisles, or raise parts and machinery to working levels.

Write for specifications and other details.

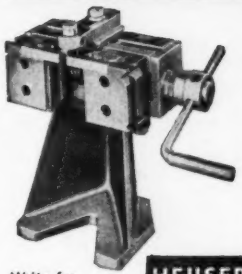
ECONOMY ENGINEERING

4509 W. Lake St., Chicago 24, Ill.

*Priced f.o.b. Chicago

CIRCLE INFORM-A-GRAM KEY NO. 1293

SPEED UP DRILLING & TAPPING JOBS!



JOHN'S DRILL JIG

For cross or end drilling round, hexagon, or square stock or standard or odd-shaped rough castings from ⅛" to 8" O.D., the self-centering "John's Drill Jig" will cut tooling and production costs to minimum for 10 to 100,000 pieces.

Standard removable slip fit bushings and holders available to drill center or mean off-center. The self-centering action will hold within .0015" or better regardless of jig wear or piece part O.D. variation. Jigs available in three sizes 6", 8", 14"; jaw openings 2", 3¼", 7½".

Write for complete information.

HEUSER MANUFACTURING CO.

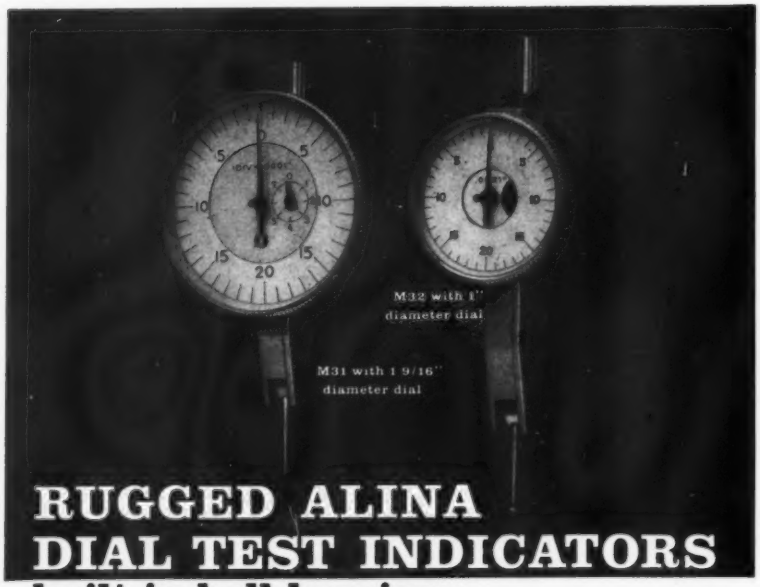
1642 N. Paulina St., Chicago 22, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 1294

How-To-Do-It Reference Books

Adhesive Bonding Of Metals	$ 2.95 ea.
Principles Of Inventory Management	$ 2.00 ea.
Brazing Manual	$ 4.75 ea.
Diamond Technology	$10.00 ea.
Die Designing & Estimating	$ 7.50 ea.
Electroplating Engineering Handbook	$10.00 ea.
Engineering Uses of Rubber	$12.50 ea.
Fasteners Handbook	$12.50 ea.
Gears For Small Mechanisms	$ 5.00 ea.
Handbook Of Barrel Finishing	$ 8.25 ea.
Handbook Of Layout and Dimensioning For Production	$15.00 ea.
Induction And Dielectric Heating	$13.50 ea.
Instruments For Measurement And Control	$10.00 ea.
Principles & Methods Of Sheet Metal Fabricating	$11.00 ea.
Protective Coatings For Metals	$12.50 ea.

For other books, information on ordering and our 10 days Trial Offer please refer to the Huebner Publications ad on page 86.



RUGGED ALINA DIAL TEST INDICATORS

built-in ball bearings

for greater sensitivity—reduced pressure—improved accuracy

- Jeweled • Shock Proof • Range .032" • Graduated .0001"
- Reading 0-20-0 • Fully reversible contact point

Available with a wide variety of rectangular or round shanks.

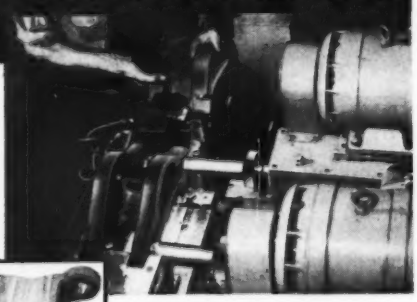
The instruments shown here are part of a complete line of precision DIAL TEST INDICATORS of all types — Write for brochure!

ALINA CORPORATION

122 East Second St., Mineola, L.I., N.Y.

CIRCLE INFORM-A-GRAM KEY NO. 1301

NEW CORE DRILL INCREASES PRODUCTION EIGHT TIMES



Wetmore Gun Type Core Drills equipped with Throw Away Carbide Tips reduce machining time from 25 to 3 min. producing 1¾" dia. holes in one pass in heat treated, cast manganese-molybdenum steel parts. The operation is performed at Web Wilson Oil Tools, Inc., Gardena, Calif.

2 Core Drills are used in a special 2-spindle horizontal machine designed and built by Web Wilson. Parts are loaded and unloaded on a 2 position rapid traverse table while another part is in the work position being machined. Operation was formerly done on a drill press requiring separate drill and reaming operations.

Workpiece—Oil Drill Pipe Tong Jaw, cast alloy steel, heat treated for maximum strength.

Wetmore Core Drills machine 112 holes per tip. Previous HSS drill & ream method produced 10 holes per regrind.

OTHER ADVANTAGES OF WETMORE CORE DRILLS

Throw Away Carbide Tips—Square tips provide 8 fresh cutting edges that can rapidly be reset at the machine by the operator.

No regrinding required—Precision ground tips are readily replaceable and fit into precision ground seats—no adjustments required, fast tip resetting and renewal.

Less Tool Cost—Cost of tips is less than normal consumption of high speed drills and reamers. On this job 112 holes machined per tip compared to 10 holes per sharpening of high speed steel drills.

Eliminates Reaming—These Core Drills open up a rough hole in one pass removing ⅛" material on a side and produce a superior finish within .0005".

Use Wetmore's Fast, Complete Service for a full line of Standard stocked cutting tools as well as Special Cutting Tools designed from your drawing or part.

Wetmore Tool and Engineering Co.

5320 E. Washington Blvd., Los Angeles 22, California

Wetmore Tools

Boring Tools | Reamers | Core Drills | End Mills Routers | Port Contour Cutters | Form Cutters | Milling Cutters | Special Cutters

CIRCLE INFORM-A-GRAM KEY NO. 1302

ADVERTISER'S INDEX

Tapmatic Corporation 123
Thriftmaster Products Corp. 109
Titan Tool Supply Co. 91
Tomco, Inc. 90
Trico Fuse Mfg. Co. 91
True-Trace Sales Corp. 28
Twentieth Century Mfg. Co. 109

United States Diamond Wheel Co. ... 4
United States Drill Head Co. 127
U. S. Industries, Inc.
Clearing Machine Corp., Div. 131
U. S. Tool Company, Inc. 16
Universal Engineering Co. 7

Vascoloy-Ramet Corp. 3
Vernon Devices, Inc. 127
Vogel Tool & Die Corp. 106

Wales-Strippit, Inc. 30
Walls Sales Corp. 90
Ward Machinery Co. 113
Wardwell Mfg. Co. 82
Waterbury Farrel Foundry & Machine Co. 77
Watts Brothers Tool Co. 95
Weldon Tool Company 34
Wells Manufacturing Co. 97
Wespo Division, Vlier Engineering .. 25
Wetmore Tool & Engrg. Co. 130
S. B. Whistler & Sons, Inc. 97
Wilton Tool Mfg. Co., Inc. 78
Carl Wirth & Son Co. 102
Wisconsin Drill Head Co. 112

The Yoder Company 26

Zagar, Inc. 74

ADVERTISING REPRESENTATIVES

CHICAGO 1:
Robert R. Pierson,
333 N. Michigan Ave.,
FRanklin 2-4811

CLEVELAND 18:
Jerry J. Miller,
1975 Lee Road,
FAirmount 1-4040

DETROIT 2:
R. F. Pickrell & Associate
318 Stephenson Bldg.,
TRinity 1-0790

NEW YORK:
Jack Bain Co.
545 Fifth Ave.,
MUrray Hill 2-3345

NEW ENGLAND:
Meade & Co.,
454 Statler Office Building
Boston 16, Mass.,
LIberty 2-9677

WEST COAST:
M. D. Pugh & Assocs.,
Altadena, Cal.
P.O. Box 635
SYcamore 7-2894

Palo Alto, Cal.:
Hunter Vinton
16 Crescent Drive
DAvenport 5-4815

YOU SAVE WITH CLEARING PRESSES

With a bottom drive press, the main floor is cleared for better material handling, increased safety and improved appearance. The lower level simplifies scrap removal and equipment maintenance.

360° Limit Switch
speeds changeover time.

Automatic Shutheight Control
speeds adjustment, increases accuracy.

Hydraulic Overload Protection
increases safety.

WITH A LINE LIKE THIS...OR A LINE OF TORC-PAC O.B.I.'s—CLEARING PROVIDES THE ULTIMATE IN METAL FORMING EFFICIENCY

Clearing is now building a line like the one above. Presses like these equipped with moving bolsters and the latest features and control devices (as shown at right) are the way to increase profits and production by combatting rising material and manufacturing costs.

Undoubtedly, your production problem is different from the one solved by the press line above. However, whatever the problem—whatever the type or size of press equipment, feeding equipment and dies are best for you—you can rely on Clearing for the most effective solution. Call on Clearing at any time.

Bulletins on Moving Bolster and Bottom Drive Presses are available now.

Clearing division of U.S. Industries, Inc. manufactures Torc-Pac presses, hydraulic presses, Clearing-Axelson and Clearing-Harrison lathes, dies and special tooling, and special equipment for the aircraft and missile industry.

USI **Clearing**

DIVISION OF U.S. INDUSTRIES, INC.
6499 W. 65th Street, Chicago 38, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 131

HUEBNER PUBLICATIONS, INC.
1975 Lee Rd., Cleveland 18, O.

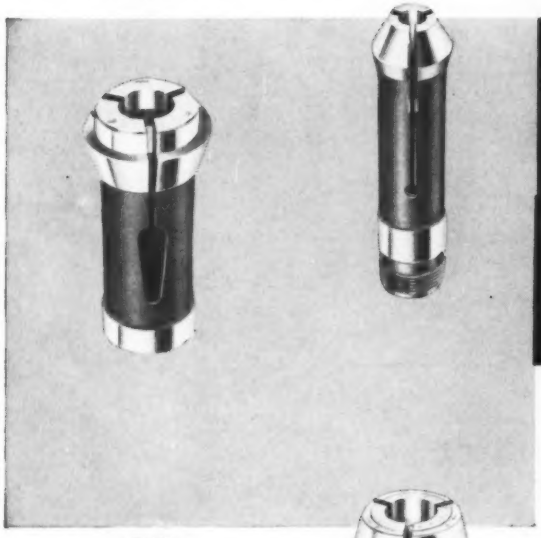
Form 3579 Requested

CIRCLE INFORM-A-GRAM KEY NO. 132

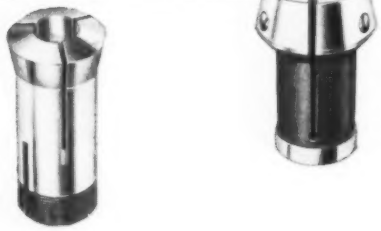
PREFERRED . . .

FOR PRECISION . . .

AND PRODUCING PROFITS



BENCO PUSHERS



The quality and quantity of the work you turn our depends to a great degree on your holding tools. When speed and accuracy in production are important, leading manufacturers always choose precision made Benco Collets and Pushers.

Benco Collets and Pushers, in addition to working better and lasting longer cost no more than ordinary collets and pushers. Their quality and performance has been proven in use by a long list of satisfied customers.

Benco products in standard sizes for popular machines are delivered immediately from stock. Write for catalog and price list.

BENCO

COLLET MANUFACTURING CO.

CLEVELAND 14, OHIO